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THE PHYSIOGRAPHY OF THE MIDDLE CLARENCE VALLEY, NEW ZEALAND.

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A. Introduction. B. Brief description. C. Probability of a regional uplift antedating the Orogenic uplift. D. The great bend of the Clarence. E. Asymmetry in the cross-profile of the valley. F. Earthquake rents. G. Reliefforms developed on the covering strata: (*a*) The monoclinal ridge of limestone; (*b*) The dissection of the valley lowland. H. Absence of evidence of glaciation: (*a*) On the mountains; (*b*) In the valley.

Appendix: Note on the solid geology of the Middle Clarence valley: (*a*) The oldermass; (*b*) Intrusions in the oldermass; (*c*) The covering strata; (*d*) Structure.

A. *Introduction.*

The long straight valley between the Kaikoura, or inland Kaikoura, and seaward Kaikoura, or Lookers-on ranges, in Marlborough, N.Z., is occupied by the middle reach of the Clarence river, which flows northeast through it, and it is generally known, therefore, as the Middle Clarence valley. Its origin is bound up with that of the enclosing ranges. These are, for the most part, composed of relatively old rocks with a deformed structure, but along the line of the valley younger rocks are involved (Fig. 1); and it is the attitude of these younger rocks, and their relation to the older, that give the clue to the nature of the uplifts which gave birth to the mountains and determined the position of the valley.

The aim of this paper is to give an explanation and description of the detail of the relief, only in the north-eastern portion of the Middle Clarence valley, which the writer has twice visited; once, for a week, in the early part of 1912, and again, for several weeks, in December of the same year. Brilliantly fine weather, allowing excellent opportunities for physiographic work, was experienced on both occasions. The writer

accompanied Dr. J. Allan Thomson of the New Zealand Geological Survey, the chief object of the expeditions being the collection of fossils, but it was found possible also to investigate the physiography in some detail. It was impracticable, with the resources available, to visit the upper (south-west) end of the valley, but, thanks to the straightness and openness of the valley and the clearness of the atmosphere, it was possible to obtain long-distance views from a number of high points. It is, therefore, with confidence that conclusions as to the history of the Middle Clarence valley as a whole are presented, and these conclusions are further strengthened by the writer's observations made in the neighbouring

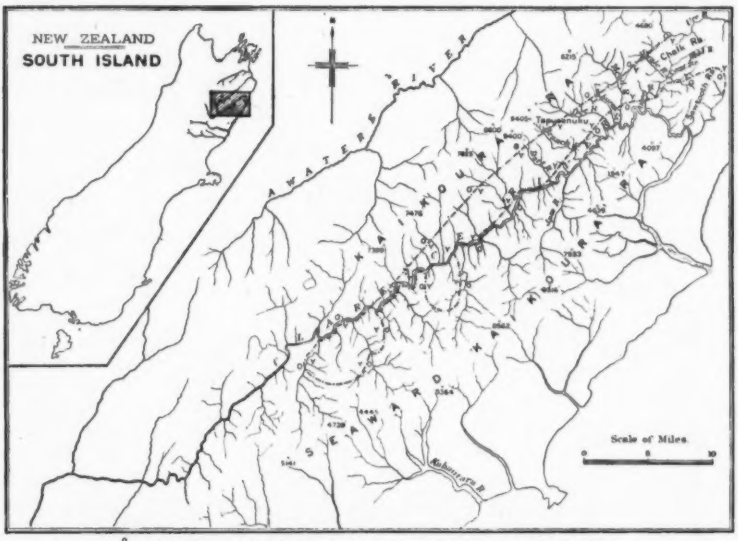
NEW ZEALAND
SOUTH ISLAND
AWATERE RIVER
Tapuaenuku
Scale of Miles
Boundary between Rocks of Oldermass (O) and Younger or Covering Strata (Y). (after Mr Kay.)

FIG. 1.—MAP OF THE MIDDLE CLARENCE VALLEY, MARLBOROUGH, NEW ZEALAND. THE INSET MAP INDICATES THE LOCALITY.
(Topography from maps by N.Z. Lands and Survey Department.)

Awatere valley, in Eastern Marlborough, and in the Amuri and North Canterbury districts, which lie farther to the south-west.

The writer wishes to acknowledge his indebtedness to Dr. J. Allan Thomson for encouragement and helpful advice, both in the field and in the preparation of this paper.

Since the aim of the paper is to give only an explanatory description of the relief, the account given of the geological structure is limited to the minimum required in explanation of the relief. The use of formation-names is for the same reason avoided. In some cases names in common use are given in footnotes, and an appendix supplies a *résumé* of

what is known of the solid geology. It is hoped in this way to make the description intelligible to readers who are unacquainted with the intricacies of New Zealand stratigraphy and the controversies concerning it.

In order to avoid wearisome periphrases, the writer has been tempted to adopt the terms "oldermass" and "covering strata" from Davis's description of the "morvan." * Although the district cannot be described as a morvan, it may be regarded as a somewhat aberrant morvan in the making.

B. *Brief Description.*

A general idea of the structure may be obtained from the back portion of the diagram, Fig. 2.† In the diagram, planation of the underlying rock series or "oldermass" is assumed to have been complete before the deposition of the overlaying series or "covering strata." While this assumption

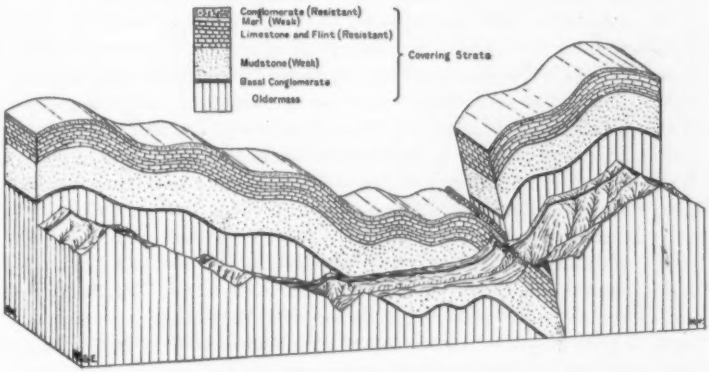

FIG. 2.—DIAGRAM ILLUSTRATING THE TYPE OF STRUCTURE AND SCULPTURE IN THE MIDDLE CLARENCE VALLEY.

may not be fully justified, the uniformity of the covering strata over a large area indicates that the surface was, at least, of relatively low relief.

It will be seen that portions of two anticlinoria are represented with an intermediate synclinorium, one limb, however, being replaced by a reversed fault of enormous throw. The axes of the anticlinoria correspond with the Kaikoura and seaward Kaikoura ranges, and the axis of the synclinorium with the Clarence valley. The immediate result of the deformation was that the synclinorium was occupied by a consequent stream, now known as the middle reach of the Clarence river. From the anticlinoria have been carved the two Kaikoura ranges, which in their present form exhibit essentially the work of normal erosive agencies only.

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* W. M. Davis, *Bull. Geol. Soc. Am.*, **23**, p. 118, 1912.

† See, however, Appendix, sec. *d*, for further remarks on Fig. 2.

They are *one-cycle* mountains, the cycle inaugurated by the orogenic uplift, by which the anticlinoria were uplifted, being still current within the mountains, while a second, much more recent uplift, of a regional character, amounting to a few hundred feet, has caused deepening of the gorges only of the lower reaches of the dissecting streams.

In the cycle introduced by the orogenic uplift the Clarence river became graded. A great portion of the mass of covering strata was eroded off, the weak mudstones forming the lower members * were exposed, and their surface was reduced to low relief; but the outcrop of a resistant stratum of limestone and flint,† occurring in the upper part of the covering strata, formed, and still forms, especially in the north-eastern part of the valley, where it is thickest, a prominent monoclinal ridge along the foot of the Kaikoura range, its dip slope towards the range, and its escarpment facing the valley lowlands. The narrow middle strip in Fig. 2 represents the cross profile of the valley at this stage.

Regional uplift of a few hundred feet next followed, resulting in the rejuvenation of the Clarence and its tributaries, and the dissection of the valley lowland. The Clarence river, graded with respect to the new base-level, is entrenched towards the north-eastern end of the valley, to a depth of 400 or 500 feet. The present form of the mountains and of the valley is shown diagrammatically in the front portion of Fig. 2.

The stages in the history of the valley that have been thus far indicated may be summarized as follows:—

1. Denudation of a deformed oldermass. (Whether nearly complete planation resulted cannot be definitely stated.)
2. Deposition of the covering strata.
3. Orogenic uplift.
4. A cycle of erosion which may be named the "great denudation."
5. Regional uplift of relatively small amount.
6. Renewed denudation, a cycle which is still current, and may be termed the "cycle of rejuvenation."

Reasons will be given later for inserting additional episodes of local ‡ and regional § uplift towards and at the end of stage 2 respectively.

The general direction of the numerous tributaries, which reach the Clarence from the mountains on either hand, must, at first, have been consequent upon the form of the surface of the covering strata after the orogenic uplift. In the mountains, where the oldermass has been laid bare by erosion, these streams, if they have persisted in their courses, must now be superposed consequents. To this class the streams draining the highest part of the Kaikoura range (the Tapuaenuku massif) appear to belong, since their courses are approximately at right angles to the elongation of the range, and for other reasons which will be discussed in

* Appendix, sec. *c*.
† The Amuri limestone. Appendix, sec. *c*.
‡ Appendix, sec. *a*. § *Infra*, sec. C.

a later paragraph.* In the case, however, of many of the streams from the seaward Kaikoura range, and also, if we may judge from the maps issued by the Lands and Survey Department, of these from the south-western end of the Kaikoura range, the streams are aligned in nearly parallel north-south lines, making an angle of about 45° with the elongation of the ranges and of the Clarence valley. Apparently these lines are determined by some structure of the oldermass, possibly the stratification, but has not been investigated. These streams may be classed provisionally as subsequents.

C. *Probability of a Regional Uplift ante-dating the Orogenic Uplift.*

The foregoing description has been limited to an area in which the record preserved by relief-forms gives no inkling that before the Orogenic uplift the covering strata had risen above sea-level. The Orogenic uplift was not, however, confined to the Kaikoura mountains. Throughout the whole of Eastern Marlborough, and south-westward into North Canterbury, folding took place which differed from the Orogenic uplift of the Kaikouras only in degree. Moreover, to the north-east and south-west of the Kaikouras, where the uplifts have been of smaller amount, the drainage, instead of following longitudinal courses like that of the Middle Clarence, is transverse, the streams taking a straight course to the sea across both anticlinal arches and synclinal troughs. Streams of this nature are the Waipara,† Hurunui, Waiau, and Conway to the south-west, the Ure and Flaxbourne to the north-east, and the *lower* course of the Clarence itself. The conclusion seems inevitable that, before the folding movement, a simple regional uplift of relatively small amount had taken place, exposing the covering strata as a coastal plain with a gentle slope seaward, down which the above-mentioned rivers took consequent courses to the sea, and that these rivers were able to persist in their courses during the period of deformation by folding. They are thus *antecedent* rivers.

This explanation appears to the writer more satisfactory, than that given by Speight,‡ following out a suggestion of Hutton's,§ that the Waiau, Hurunui, and Waipara are "superimposed," for Speight's explanation is based on the assumption that the oldermass ridges, which the rivers cross, are not anticlinal cores, but formed islands in the Cretaceous and Tertiary sea, a view from which the present writer dissents. Only in the region where the uplift was greatest, *i.e.* in the Kaikoura area, the rivers that formerly crossed the site of the Kaikoura ranges ‖ were diverted by the

* *Infra*, sec. G, *a*.

† See Speight, R., "The Lower Waipara Gorge," *Trans. N.Z. Inst.*, **44**, pp. 221–233 (1912).

‡ Speight, *Loc. cit.*, p. 225.

§ Hutton, F. W., *Trans. N.Z. Inst.*, **37**, p. 467 (1905).

‖ In this connection the effects of the hypothetical local uplift towards the end of Stage 2 (See Appendix, sec. *d*) would be the same as those of the Orogenic uplift.

rapid rise of the mountain masses, and forced to follow the Clarence depression. Even here, one river, reinforced by the waters of the diverted streams, persisted in its course as the lower Clarence, which crosses the seaward Kaikoura anticlinorium near its north-eastern end in a steep-walled gorge, nearly 4000 feet deep, cut in the rocks of the oldermass.

D. *The Great Bend of the Clarence.*

It follows from the explanation given in the preceding paragraph that the bend of a right angle, made by the Clarence river as it leaves the broadly opened Middle Clarence valley to enter its lower gorge, owes its existence to the fact that the river there leaves a course consequent on the deformation to follow one antecedent to the deformation. This conclusion, however, might not be reached from inspection of the map. When the

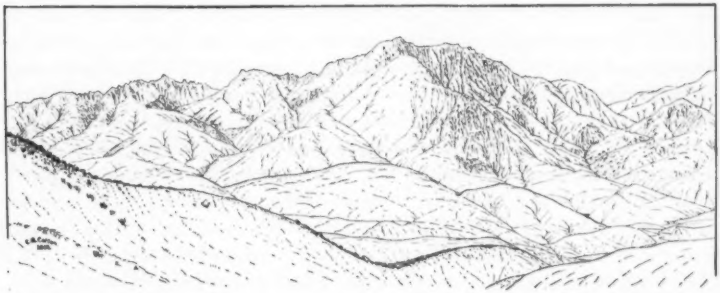

FIG. 3.—THE SAWTOOTH RANGE. VIEW LOOKING SOUTH-EAST FROM THE ESCARPMENT OF THE CHALK RANGE.

writer first entered the Clarence valley he fully expected to find that the great bend of the Clarence was an elbow of capture, and clearly this hypothesis deserved consideration. It was found untenable for two reasons :—

(1) There is no gap by way of which the Clarence could have had its outlet before the hypothetical capture. A search for a possible outlet reveals the fact that the Middle valley, at its north-eastern end, is enclosed by a massive limestone barrier, formed in part by a continuation of the monoclinal ride of the Kaikoura mountain-foot, which swings round to a more easterly direction as the Chalk range (see sect. G, *a*), and farther on by a continuous, much-deformed mass of the same limestone, cut into several peaks and merely notched, at heights of not less than 2000 feet along the divide between the Clarence and Ure basins, by saddles between the heads of young ravines. This high-standing limestone mass not only closes in the valley, but swings completely around the north-eastern end of the seaward Kaikoura anticlinorium, from which, north-eastward of the Clarence gorge, has been carved the Sawtooth range

(Fig. 3). A description of the relief in this rugged limestone area does not come within the scope of this paper, but it has been necessary to mention it in connection with the problem of the lower Clarence gorge. Fig. 4, which is drawn from a field-sketch, with the proportions corrected from a photograph taken from the same point of view, indicates the manner in which the north-east end of the valley is closed.

It is scarcely necessary to add that no traces have been found either of high-level gravels or of terrace remnants that would indicate that the Clarence, at an earlier stage of its history, had its outlet in a north-easterly direction.

(2) No other eastward-flowing stream has made any progress in breaching, by headward erosion, the continuous wall of the seaward Kaikoura range. The only stream, the case of which might be considered an exception to this statement, is the Kahautara, but the Kahautara lies 30 miles to the south-west, and is beyond the highest part of the seaward Kaikoura range, and it is probable that it follows an antecedent course.

The apparently anomalous, roundabout course of the Clarence was pointed out by McKay,* who, however, made no definite suggestion in explanation of it.

E. *Asymmetry in the Cross-Profile of the Valley.*

The asymmetrical form of the Clarence valley synclinorium has determined a pronounced asymmetry in the form of the valley, especially near its north-eastern end. There is a noticeable lack of symmetry in the relief of the valley strip of covering strata, this being made apparent chiefly by the presence of the limestone monoclinal ridge (described in sections B and G, *a*) along the north-western side; and, when the cross-profile of the valley as a whole is considered, a striking contrast is noted between the average slopes, on opposite sides, of the higher parts of the ranges, from which the covering strata have been stripped. The map, Fig. 1, shows that the strip of covering strata in the valley is very much nearer to the crest of the Kaikouras than to that of the seaward Kaikouras.

In a view up the valley, looking south-west from the escarpment of the Chalk range, the asymmetry is very noticeable. Fig. 5 is a panoramic view from this point, drawn from a field sketch, the proportions being corrected from photographs taken from the same point of view. This panorama indicates how the seaward Kaikoura range sends down long spurs to the valley, the average slope of the crests of which is relatively gentle. The ends of the spurs are truncated by precipitous rocky bluffs, but this is the effect of cutting by the Clarence river, and especially of the extra deepening due to the late regional uplift (stage 5 in the history of the relief-development as given in sec. B). In a distant view these precipitous

* A. McKay, 'Geol. Surv. of N.Z., Reports Geol. Expl. during 1888-89,' pp. 88-89 (1890).

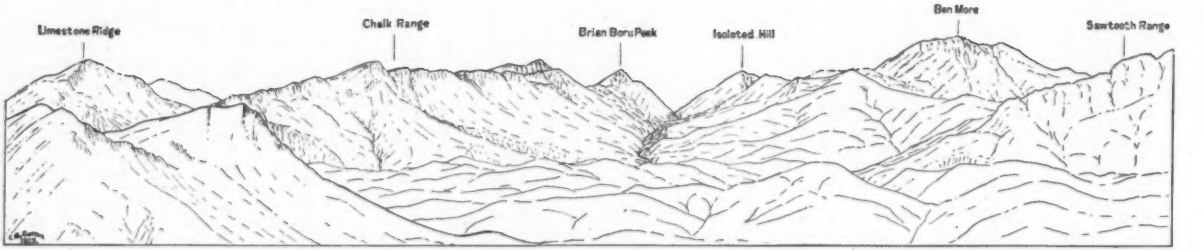

FIG. 4.—THE MOUNTAIN WALL ENCLOSING THE MIDDLE CLARENCE VALLEY AT ITS NORTH-EAST END. VIEW LOOKING NORTH-EAST FROM THE CREST OF THE LIMESTONE RIDGE BETWEEN THE DEE AND BRANCH RIVERS.

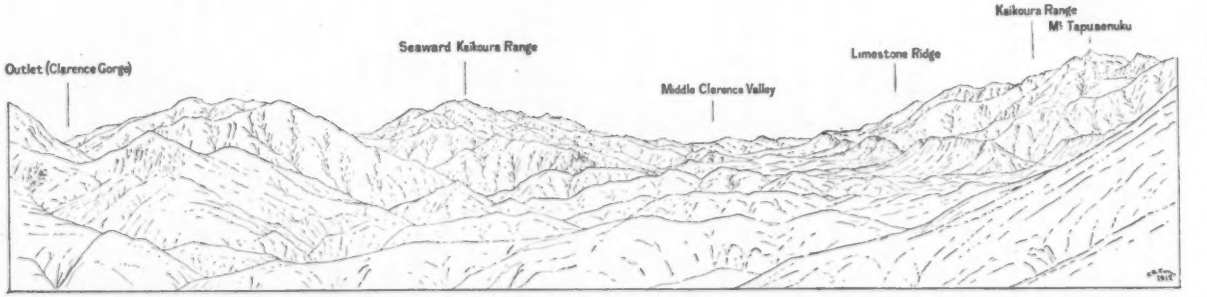

FIG. 5.—PANORAMA OF THE MIDDLE CLARENCE VALLEY, LOOKING SOUTH-WEST FROM THE ESCARPMENT OF THE CHALK RANGE.

bluffs truncating the spurs are seen to be only a minor feature of the cross-profile, and the ascent from the valley to the crest of the range seems gentle and even. This effect is given, however, only by the crests of sharp-edged spurs separated by young ravines. It is noticeable that, in some cases the spurs, instead of being terminated suddenly at the edge of the Clarence, are continued beyond the river as short island-like ridges, both spurs and island-ridges being probably determined in position by more resistant bands in the rocks of the oldermass. The most prominent of the island ridges noted is Gibraltar rock (see Fig. 6) which continues, on the north-west side of the Clarence, the line of the long spur west of the Jam river.

It is on the northern ends of these ridges that should be found preserved, if anywhere, fragments of the fossil erosion surface * upon which the sediments of the covering strata were laid down, and, if neighbouring portions

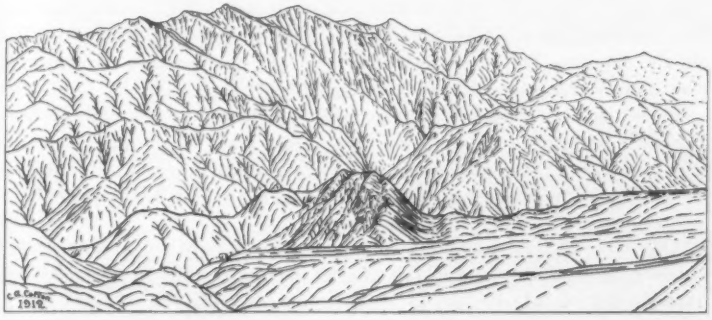

FIG. 6.—VIEW LOOKING SOUTH-EAST ACROSS THE CLARENCE FROM THE CREST OF THE LIMESTONE RIDGE BETWEEN THE DEE AND BRANCH RIVERS, SHOWING GIBRALTAR ROCK, AND DISSECTED FANS SLOPING AWAY FROM KAIKOURA RANGE.

are in line and parallel to the stratification of the lower beds of the covering strata, it will indicate that the surface was a peneplain. Time was not available for a search for these stripped remnants, but it is suggested that an evenly sloping facet on the north-west side of Gibraltar rock may be of this nature (see Fig. 6).

It will be gathered from the statements in the preceding paragraphs, and also from the map (Fig. 1), that, opposite the highest part of the Kaikoura range, the Clarence river is flowing on the oldermass, some distance beyond the boundary of the covering strata, and no evidence has been noted that would indicate an earlier course along the present outcrop of the covering strata. A possible explanation is that in the stage immediately following the Orogenic uplift, the young consequent stream was forced over to the south-east side of its tectonic valley by the waste

* See W. M. Davis, 'The Colorado Front Range,' *Ann. Assn. Am. Geogr.*, vol. 1, p. 64 (1911).

streams from the Kaikoura range side. The accumulation of waste would be mainly a talus slope of material breaking away from the overhanging fault-scarp as it rose, but this would be reinforced by enormous fans brought down by torrents from the whole of the steep front of the initial Kaikoura range. If this explanation is the correct one, this departure of the Clarence from the present outcrop of the covering strata is a direct result of the asymmetrical form of the valley synclinorium.

The comparatively gentle average slope of the seaward Kaikoura side of the valley, which has been referred to in preceding paragraphs, points to the conclusion that the mean dip of the south-eastern limb of the valley synclinorium was at a fairly low angle. Not only, however, have the covering strata been stripped off, but the rocks of the oldermass have also been denuded to such an extent that the actual form of the limb can be only tentatively restored, as in the left half of the back portion of Fig. 2.

In profile the front of the Kaikoura range forming the opposite (north-west) side of the valley presents a very different appearance (see Fig. 5). In the diagram, Fig. 2, the reversed fault which determines the front of the range is represented with a throw of 8000 or 10,000 feet, but it is possible that it is considerably more, and there is no way of arriving at an accurate estimate of its amount. The abrupt front of the range is connected with the origin by fracture of the initial form, the slope of the whole front from crest to base being steep, and that of the last 3000 or 4000 feet of the descent especially so.

Between the numerous deep ravines are left spurs which end abruptly in the neighbourhood of the fault-line, *i.e.* behind the outlying monoclinal ridge of limestone. Unlike the spurs on the opposite side of the valley, these have not been truncated by the Clarence river. South-westward of the Dee the steep spur ends assume the form of enormous facets (see Fig. 5), and the steep, even slope of these suggests that they preserve, with little modification, portions of the steep face of the range as it appeared immediately after the cessation of the movement on the fault-plane, and of the slumping of the whole mountain face which must have, step by step, accompanied the faulting, since the formation of an overhanging scarp is manifestly impossible.

Above these strong facets appears a prominent bench, the spurs running back with fairly even slope to the crest of the range, and, it may be suggested, indicating roughly the form of the anticlinal arch beyond the fault, as represented in the right half of the back portion of Fig. 2.

The foregoing explanation of the scarp of the Kaikoura range differs from that given by Hector,* who ascribed it to the presence of a network of dykes of igneous rock, which he regarded as absent from the higher part of the range. According to McKay,† however, these intrusions are not confined to the front scarp, but the whole of the higher part of the range,

* Sir James Hector, 'Geol. Surv. of N.Z., Reports for 1885,' p. xvi. (1886).

† A. McKay, 'Geol. Surv. of N.Z., Reports for 1888-9,' p. 131 and map (1890).

FIG. 7.—TAPUAENUKU, THE HIGHEST PEAK OF THE KAIKOURA RANGE. NOTE THE ISLAND-LIKE MASS OF LIMESTONE IN THE MIDDLE DISTANCE SEPARATING THE TWIN GORGES OF THE BRANCHES OF THE DEE.

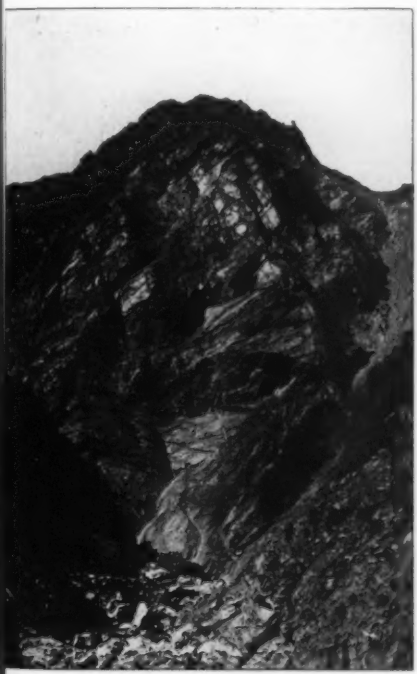

FIG. 8.—VIEW LOOKING UP THE NORTH BRANCH OF THE DEE, IN THE ROCKS OF THE OLDERMASS.

FIG. 14.—FALL NEAR THE MOUTH OF A SMALL TRIBUTARY OF THE OUSE. THIS VIEW ILLUSTRATES THE YOUNG STAGE OF DISSECTION REACHED IN THE "CYCLE OF REJUVENATION."

FIG. 9.—NEAR VIEW OF THE BENCH FORMED BY THE EARTHQUAKE RENT ON THE HIGH SPUR BETWEEN THE DEE AND THE BRANCH. LOOKING SOUTH-WEST.

FIG. 11.—THE ESCARPMENT OF THE CHALK RANGE. VIEW LOOKING NORTH-NORTH-WEST.

including the highest group of peaks culminating in Tapuaenuku, is seamed by them. It is possible that the peaks owe their present height to the resistant character of the intrusive rocks.* It is equally possible, however, that the group of highest peaks marks the point where the anticlinal uplift was greatest, and that the presence of the intrusions does not appreciably affect the relief.

In front of the scarp, south-westward of the Dee, there is a stretch of piedmont plain, now dissected (see Figs. 5 and 6), formed by the coalescence of fans of coarse waste. The writer had not an opportunity of examining the whole of it closely, but it is described by McKay † as completely smothering, at one point, the monoclinal ridge of limestone. The fans were built forward after the reduction of the valley lowland to low relief, and therefore indicate a sudden great increase in the supply of waste from the mountains. This may be explained either by renewed differential uplift of the neighbouring part of the inland Kaikoura range or by some climatic change. If the former explanation is the correct one, and if the renewed uplift took the form of motion along the old fault-plane, it accounts for the good state of preservation of the scarp. Since the piedmont plain has been dissected by the streams revived by the late regional uplift, it may be assumed that active differential uplift is no longer in progress. The writer is unable to say whether this dissection had begun before the regional uplift took place. That disturbance of some kind, though probably not differential uplift, has taken place very recently along the fault-line is indicated by the presence of an earthquake rent which will be more fully described in the next section.

Farther to the north-east (*i.e.* north-eastward from the Dee) the front scarp has been completely dissected by crowded streams (see Figs. 7 and 8). In the north branch of the Dee, for example, the fault is exposed in section on the side of a spur which has been so narrowed that its crest is horizontal for some distance on either side of the fault-line. At this point, then, it is seen that the rocks of the oldermass and the conglomerate,‡ which is the highest member of the covering strata, and is faulted against the oldermass (see Fig. 2), are equally resistant, so that erosion does not reveal the presence of the fault by a break in the crest-line of the spur. Similarly, at no place where these two rocks are in contact has an erosion-formed scarp in either direction been noted.

Towards the north-east end of the valley, owing to the single fault passing into imbricated structure, the hard conglomerate has, in places, softer members of the covering strata on both sides of it, and it is only under these conditions that it stands up locally as a monoclinal ridge, as, for example, behind the Chalk range, and, less prominently, between the

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* McKay, *Loc. cit.*, p. 135.

† A. McKay, 'Geol. Surv. of N.Z., Reports for 1885,' p. 128 and section on p. 96, 1886.

‡ The "Post-Miocene Conglomerate" of McKay: see Appendix, sec. c.

Dee and the Limburne. Further reference to these features will be made in section G.

F. *Earthquake Rents.*

Earthquake rents, or, more correctly, a single more or less continuous rent, mark the course of the Clarence fault along the scarp of the Kaikoura range for many miles south-westward from the gorge of the Dee.* It was examined by the writer on the high spurs between the Dee and the Branch, and could be traced by the eye as far as the Dart. It takes the form of a bench, about 20 feet in width, following an approximately straight line, up and down over the smaller inequalities of the surface, along the facets of the front scarp of the range. Fig. 9, a photograph, shows its profile at the point examined. This is, however, on the edge of a blunt angular projection of the scarp, and the slope shown is therefore much flatter than the average.

FIG. 10.—VIEW LOOKING SOUTH-WEST ALONG THE LINE OF THE EARTHQUAKE RENT ACROSS THE BRANCH AND TOWARDS THE DART, FROM THE HIGH SPUR BETWEEN THE DEE AND THE BRANCH.

A "rent" of the same nature is present along the north-west side of the Awatere valley (see Fig. 1) throughout the greater part of its length, and it also follows the course of an old fracture. Owing to the abrupt change of slope, these rents, especially where the vegetation is tussocky grass, are visible at a distance of many miles as light-coloured lines along the mountain-side.† It is reported that the rents opened during the great earthquake of 1855, and perhaps also in 1848,‡ and probably they were in existence before 1848, being then merely re-opened.

So far as the writer has been able to judge from personal observation, the nature of the rents shows that the movement or disturbance that formed them was not a differential movement of the walls of the fault-planes in a vertical direction, for no scarps have been noted in any sense resembling those at Genoa, Nevada, described by Lawson. § Hector's

* A. McKay, 'Reports for 1885,' p. 132.

† For views of the rents in the Awatere valley, see A. McKay, "Reports on Recent Seismic Disturbances within Cheviot County" (November and December, 1911), figs. opposite pp. 10 and 17. Wellington: 1912.

‡ Hector, 'Reports for 1888–89,' p. 41, 1890.

§ A. C. Lawson, '*Bull.* Seismolog. Soc. of Am.,' vol. 2, pp. 193–200, 1912.

statement that recent movements have, in the Clarence valley, given rise to an abrupt step at the surface,* is apparently based on a misunderstanding of the description given by McKay.†

It is perhaps less easy, at this late date, to decide whether movement took place in a horizontal direction along the fault-planes as in the California earthquake of 1906,‡ but it must be remembered that horizontal movement produces scarps on the sides of spurs crossed by the fault lines. These face in opposite directions on opposite sides of the spurs,§ and resemble those ascribed to oblique faulting by Martin.‖ No direct evidence has been noted either in the Clarence valley or in the Awatere that movement of this nature has taken place.

The 1855 earthquake, in the central portion of New Zealand, was the result of regional, vertical movement, or tilting,¶ affecting a large area,** and it seems probable that, since there is no evidence of movement, either on the Clarence or the Awatere fault, in the sense of the old thrusts, there was no movement at all of the walls relatively to each other, the general disturbance merely causing the old fault-fissures to gape at the surface as open trenches, which, when filled with *débris*, would present the appearance of the rents as they now are. There is no reason to believe that the earthquakes of 1848 and 1855 were caused, either wholly or in part, by earth movements along these lines.

G. *Relief-forms developed on the Covering Strata.*

Relief-forms developed on the covering strata are best discussed under two heads: (*a*) the monoclinal ridge of limestone; and (*b*) the dissection of the valley lowland.

(*a*) *The Monoclinal Ridge of Limestone.*—Mention has already been made of this monoclinal ridge which follows the base-line of the Kaikoura range, and then, as the Chalk range swings around more to the east, forming the northern rampart of the valley. It is seen in Figs. 4, 5, 11, and 13, and in the diagram (Fig. 2) its relation to the structure of the covering strata is indicated. The ridge forms a striking feature in almost any view of the north-eastern part of the valley, and it is by the scenery of the limestone gorges by which several streams break through it that earlier observers have been more impressed. McKay, for example, describes the gorges of the Swale, Mead, and Dee as "impressing the explorer

* Sir James Hector, 'Reports for 1885,' p. 15 (1886).

† A. McKay, *ibid.*, pp. 131–2.

‡ A. C. Lawson and others, 'The California Earthquake of 1906,' Carnegie Inst. Publication.

§ R. S. Tarr and L. Martin, 'U.S.G.S. Prof. Paper 69,' p. 39 (1912).

‖ L. Martin, 'Econ. Geol.,' vol. 2, p. 79 (1907); also Tarr and Martin, *Loc. cit.*, p. 40 and Fig. 1.

¶ C. Lyell, 'Principles of Geology,' 10th ed., vol. 2, p. 82 (1868).

** See map of "Earthquake Origins in New Zealand," by G. Hogben, in Marshall's 'Geography of New Zealand,' p. 219.

with the massive solidity and giant proportions of the great cliffs rising from the deepest part of the gorge," and continues, " Yet high above in the sky these terminate in clear-cut pyramidal peaks, gables, and roofs, massive below, light and airy above. Architectural in aspect, these vertical walls and steep slopes, bearing just a due proportion of flowering plants and gorgeous shrubs, may be seen and admired, but are not easily described ; and when a peep of sky dropping west from the zenith is seen, filled by the glistening snows and jagged summits of Tapuaenuka, art may strive in vain to copy the beauty, the grandeur, and the majesty of the picture." *

The Chalk range portion (Figs. 4 and 11) is about 5 miles in length, and presents a very even crest-line, with a height of about 3200 feet. There is a precipitous escarpment facing south-south-east, which is in most places unscaleable for the last 1000 feet, and below that is a scree of limestone and flint fragments, the lower part clothed with soil and vegetation, which almost everywhere conceals the soft beds beneath the limestone and flint (see Fig. 11).

The Chalk range ends to the east-north-east, at the point where the simple monocline of the limestone in the valley gives place to the completely crumpled and fractured mass that closes the end of the Middle Clarence valley. This mass is cut by deep ravines into several peaks, which are seen in Fig. 4.

The continuous ridge of the Chalk range is separated from the north-eastern end of the Kaikoura range by the broad upper valley of the Ure river, which in this part of its course is longitudinal and subsequent, or, possibly, consequent, upon the deformation, and is in strong contrast with the lower antecedent portion, which crosses the disorderly uplifted limestone mass by an almost impassable gorge.† Access to the upper Ure valley is possible by two routes ; one of these crosses the escarpment of the Chalk range from the Clarence valley, and the other crosses the Kaikoura range from the Awatere valley. The openness of the valley is in part due to the branching of the fault ‡ giving rise to imbricated structure, thus causing repetition of the highest members of the covering strata. Owing to the same cause, the upper conglomerate stands out as ridges in the depression.

Farther to the south-west, where the limestone monocline closely follows the base of the highest part of the Kaikoura range, there is, behind it, only a linear series of subsequent depressions, all of which have never been occupied by a single stream.

The continuity of this part of the ridge is broken by the gorges of streams, which may be regarded, as indicated in section B, as consequent

* A. McKay, ' Reports for 1885,' pp. 30-31 (1886).

† It is said that once a party of surveyors made their way through the gorge with great difficulty, resorting at some places to swimming.

‡ McKay, ' Reports for 1885,' pp. 93 and 118 (1886).

upon the initial form of the uplifted mass, having flowed initially, across the site of the ridge, upon great screes from the fault scarp.

Before the late regional uplift the series of subsequent depressions referred to above was eroded behind the limestone outcrop, causing the latter to stand out as a ridge with its dip-slope facing the mountains, but the amount of drainage tapped by the subsequent streams was small, and, consequently, in the later Cycle of Rejuvenation scarcely a beginning has been made in the reduction of the subsequent valleys to the new local base levels.

There are no air gaps in the limestone ridge. The drainage pattern must, therefore, have assumed approximately its present form before denudation had exposed the limestone monocline as a prominent ridge.

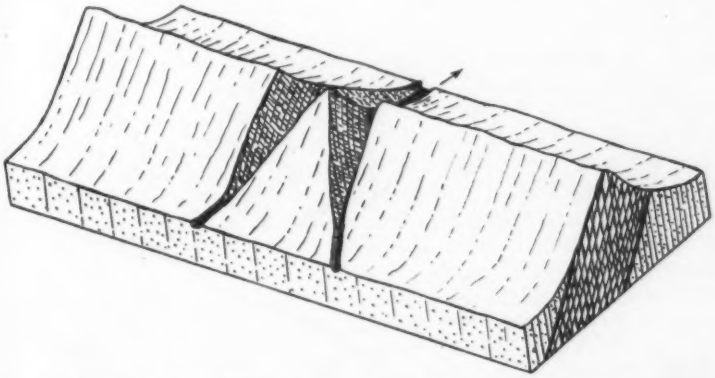

FIG. 12.—DIAGRAM ILLUSTRATING THE FORMATION OF TWIN GAPS BY THE SUPERPOSITION OF THE FORKS OF A STREAM ON A MONOCLINE OF RESISTANT ROCK.

Four of the superposed consequent streams cross the higher outstanding part of the ridge in deep gorges, namely, from north-east to south-west, the Swale, the Mead, the Limburne, and the Dee. In the last three a striking result of superposition is seen in the "splitting" of the gorges, for the Dee and the Limburne are each formed by the junction of two, and the Mead of three, branches immediately upon the limestone outcrop, with the result that twin and triple gorges have been cut. Three-sided pyramidal hills of limestone remain between the gaps, each having two sides formed by gorge walls, and the third by the dip-slope of the limestone. The formation of twin gorges by the superposition of the forks of a stream upon a monoclinal ridge is represented diagrammatically in Fig. 12. In the actual examples the pyramidal hills are lower than neighbouring portions of the ridge, owing to the fact that the stream junctions lie a little within the escarpment (see Fig. 13, a view of the gorges of the Mead).

The main arguments for regarding the south-eastward flowing streams from the highest part of the Kaikoura range as superposed consequents are contained in the foregoing paragraphs, and may be here summarized as follows :—

1. Since erosive processes have failed to excavate a continuous subsequent valley, behind the limestone ridge, along the outcrop of the weak stratum overlying the limestone, and since there are no air gaps in the

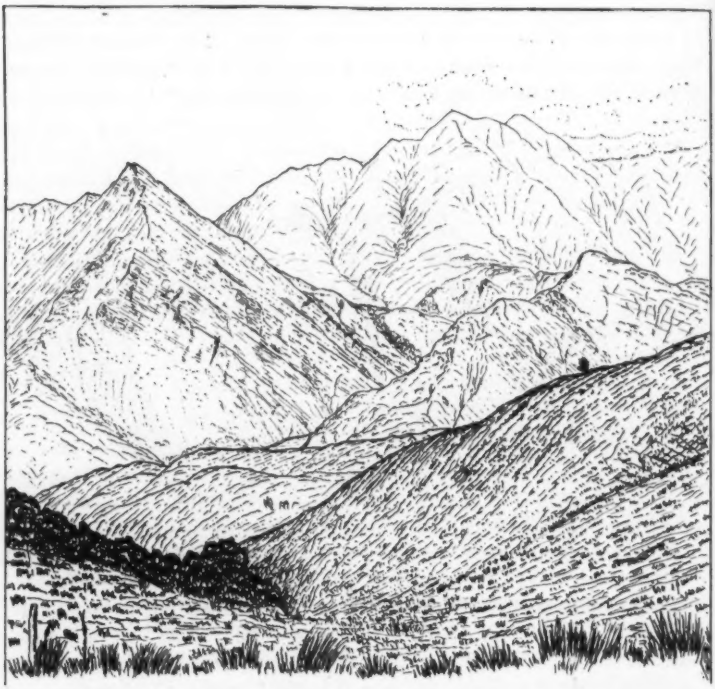

FIG. 13.—GORGES OF THE BRANCHES OF THE MEAD, ENCLOSING BETWEEN THEM AN ISOLATED PYRAMIDAL PORTION OF THE LIMESTONE MONOCLINE. THE BRANCH ON THE LEFT BIFURCATES AGAIN BEFORE THE OUTCROP OF THE LIMESTONE IS PASSED. VIEW LOOKING WEST.

limestone ridge, it may be concluded that present drainage lines were determined before the limestone monocline was exposed as a prominent ridge.

2. The writer has failed to find any explanation of the twin gorges through the limestone ridge except that outlined above, which is founded on the hypothesis of superposition.

(*b*) *Dissection of the Valley Lowland.*—It has been stated in section B

that in the cycle of the "Great Denudation" (which is still current in the mountains), the weak rocks forming the lower members of the covering strata, as developed in the north-east portion of the valley, had been worn down to faint relief, as represented in the middle strip of the diagram, Fig. 2. Owing, however, to late regional uplift, the valley lowland thus produced has been dissected by rejuvenation of the streams which cross it. These are mainly of two kinds, viz. (1) the superposed consequents from the Kaikoura range, and (2) insequent tributaries of these and of the Clarence, while there is a marked tendency, especially in the extreme north-east end of the valley, towards the development of (3) subsequents separated by concretionary and sandy bands in the prevailing mudstones.

The streams of the first class, which carry always a considerable volume of water, are graded up to, and in some cases through, the limestone gorges. Where they cross the mudstones their revived gorges are sub-mature, being opened to a fair width. The smaller, insequent streams, which carry little water and are intermittent in flow, have reached a much less advanced stage in the "Cycle of Rejuvenation," and their courses are broken by numerous waterfalls, which, as a rule, are placed one above another like a flight of steps, and which are still quite near the stream mouths. As mentioned above, the streams of the third type, subsequents, are best developed in the amphitheatre-like, north-east end of the valley, where they are represented by the several south-west flowing streams that unite to form the Ouse river. These streams, while always carrying a flow of water from the surrounding semicircle of mountains, are not yet graded. In Fig. 11 the gorges of two of these revived streams (the Cover and the Nidd) are seen, incised in the mature surface which was developed on the weak mudstones in the earlier cycle. Some flood-plain remnants, now forming high terraces, testify to the maturity of the streams before rejuvenation.

H. *Absence of Evidence of Glaciation.*

(*a*) *On the Mountains.*—The mountains of the Kaikoura and seaward Kaikoura ranges support no glaciers at the present day. Accumulation of snow takes place on steep screes of broken rock ("shingle slips"), with which, as elsewhere in the south island of New Zealand, the higher slopes are mantled, as a result of the activity of frost action and diurnal temperature changes, favoured by the shattered nature of the rocks forming the summits. Owing to the steepness of the screes, however, the snow accumulation reaches no great thickness, and, after a few warm days, disappears almost entirely.

Since small glaciers are present on the higher slopes of the isolated volcanic mountain, Ruapehu, which is about equal in height to Tapuaenuku, and is three degrees nearer the equator, their absence from the Kaikoura range must be ascribed solely to the steepness of the slopes resulting from the activity of normal agencies.

It may be noted that Hector * remarks, "There is a total absence of the results of glacier action usually found in such regions."

It is just possible, however, that some of the summit forms (see Fig. 7) were moulded in part by small valley-head glaciers during the Pleistocene glacial advance when the snow-line must have been much lower than it now is; but if that is the case, traces of glacial erosion have, almost everywhere, been removed by normal agencies, the excessive activity of which, owing to the steepness of the gradients, will perhaps be made apparent by the following quotation from McKay †: "The mountains on either side of the valley [of the Muzzle] rise 2000 feet to 2500 feet higher, and are above heights ranging from 4500 feet to 5000 feet, absolutely devoid of vegetation. Rock avalanches are as frequent here as their icy brethren are in the Alps of Canterbury, and the valley was not passed up and down without some danger from flying fragments and rolling rock-masses."

Glaciation of restricted amount might have increased the supply of waste so as to bring about the formation of the strip of piedmont plain, at the base of the Kaikoura range, referred to in section E. The occurrence of glaciated stones in the fluviatile deposit has not, however, been reported, although McKay probably searched for them, since he says that the deposit "at first sight" appears to be morainic.‡

The preservation of glacial markings on the boulders of the fan material, if these boulders have a glacial origin, is to be expected by analogy with similar deposits described by Trowbridge § in Owen's valley, California.

(*b*) *In the Valley.*—A much more intense glaciation of this part of New Zealand has been claimed by Park,‖ who describes the whole of the south island of New Zealand as covered by an ice-cap,¶ sometimes regarded as an extension of the South Polar ice-sheet **; he mentions also a "Clarence glacier." ††

It will be gathered, however, from the description already given, and no less clearly from Fig. 5, that the cross profile of the valley does not suggest that it has been moulded by ice. Nor is there an outlet through which a great ice stream could have made its way (as it is assumed that it

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* Sir James Hector, 'Reports for 1885,' p. xiii. (1886).

† A. McKay, 'Reports for 1885,' p. 50 (1886).

‡ *Ibid.*, p. 128 (1886).

§ A. C. Trowbridge, 'Terrestrial Deposits of Owen's Valley, California,' *Journ. of Geol*, vol. **19**, pp. 706–747 (1911).

‖ J. Park, 'Geology of New Zealand,' p. 183 (1910). For a more conservative account of N.Z. Glaciation, see P. Marshall, *Trans. N.Z. Inst.*, vol. **42**, pp. 334–348 (1910).

¶ 'Geology of New Zealand,' pp. 183, 249.

** *N.Z. Geol. Surv. Bull.*, No. 7 (N.S.), p. 43 (1909); *Trans. N.Z. Inst.*, vol. **42**, p. 606 (1910).

†† 'Geology of New Zealand,' p. 204. (This reference is clearly not the glaciation of the Upper Clarence referred to in *Trans. N.Z. Inst.*, vol. **42**, p. 598 (1910).)

did *). Further, no *roches mountonnées* have been found, nor stripped and glaciated rock surfaces, such as are found in formerly glaciated valleys in New Zealand as well as elsewhere. Lastly, no glacial deposits have been found on the floor or sides of the valley, the only superficial deposits, which, as McKay † says, "at first sight appear to be morainic in origin," proving to be of fluviatile origin as noted in section E.

Park has described under the heading "Marlborough Moraines" ‡ the conglomerate which is the highest member of the covering strata.§ Whether this conglomerate had or had not a glacial origin, its presence can have no bearing on the glaciation of the existing valley, or the explanation of any existing land-forms, for, since it is involved, equally with the other members of the covering strata, in the movements of the orogenic uplift, its formation must antedate those movements.

APPENDIX.

Note on the Solid Geology of the Middle Clarence Valley.

The reports by McKay ‖ are almost the only source of information on the geology of this portion of New Zealand. The following brief account is based mainly on the information contained in these reports, supplemented in a few instances by the writer's own observations.

In sections A and B of this paper use has been made of the terms "oldermass" and "covering strata." The exact sense in which these terms are used will be made clear by the following tabular comparison with the formations distinguished and mapped by McKay in the Clarence valley:—

This Paper.		McKay.¶	
	Age.		*Formation.*
Covering strata . . .	Pliocene.		Great Post-Miocene Conglomerate.
	Cretaceo-Tertiary and Cretaceous.		Cretaceo-Tertiary [or Waipara **] and Lower Greensand.
Oldermass	Carboniferous.		Maitai.

It must be noted, however, that, while the above is the classification on McKay's map, it is qualified in the text †† by the statement that the "Maitai series of the Table of Formations and on the map accompanying must be understood to include such older secondary strata as have not been satisfactorily determined as such."

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* 'Geology of New Zealand,' p. 204.

† *Loc. cit.*

‡ 'Geology of New Zealand,' p. 204.

§ "Post-Miocene" conglomerate of McKay. See Appendix.

‖ A. McKay, 'On the Geology of East Part of Marlborough,' Geol. Surv. of N.Z., Reports of Geol. Expl. during 1885, pp. 27–136 and map, 1886; 'On the Geology of Marlborough,' *ibid.*, during 1888–89, pp. 85–185 and map, 1890, and during 1890–91, pp. 1–28 (1892). (See also 'Progress Reports,' by Sir James Hector in same volumes.)

¶ *Loc. cit.*, 1890, map, p. 96.

** *Loc. cit.*, 1886, pp. 43–44.

†† *Loc. cit.*, 1890, p. 116.

a. The Oldermass.

Rocks similar to those of the oldermass of the Kaikoura ranges, occurring in various parts of New Zealand, are commonly correlated, on purely lithological grounds, or on account of the occasional presence of the annelid *Torlessin mackayi*, Bather, with the Maitai series at Nelson,* which was regarded by Hector's Geological Survey as Carboniferous, by Park † in 1904 as Jurassic, and in 1910 as Carboniferous, and by Bell, Clarke, and Marshall ‡ as Trias-Jurassic.

Park, however, separates a great area of rocks, including those of the Kaikouras, from the Maitai, and includes them in his Hokobui system § (Permo-Jurassic). McKay, in his first report (1886), described the rocks of the Kaikouras as Old Secondary and Palæozoic. Hector, however, in the Progress Report in the same volume, assigned them to the Maitai Series of Carboniferous Age, and McKay, in 1890, followed Hector, stating at the same time that he believed them to be in part of secondary age, but had insufficient evidence to make a definite subdivision. ‖

Within the area described the rocks of the oldermass appear to be all clastics, some coarse and some fine, the latter often black owing to the presence of carbonaceous matter. On the south-east side of the Clarence valley they are, at least in places, thin bedded, and, in places, much contorted; ¶ while on the north-west side, where they are separated from the younger strata by the reversed fault, they are thick-bedded and much crushed, so that stratification is scarcely recognizable. The presence in the Kaikoura range of a bed of the red-jasperoid rock, common in similar rocks throughout New Zealand, is shown by the abundance of boulders of it brought down by the streams.

The rocks of the oldermass had been folded and denuded before the deposition of the covering strata, but the direction of the axes of the older folds is unknown. The few recorded observations ** go to show that strikes and dips are variable, and it is, therefore, probable that the older axes make an angle with those of the later folding, which has affected the covering strata also, and is termed in this paper the "Orogenic Uplift." Describing adjacent areas, both Hutton †† and McKay ‡‡ have remarked upon the dome and basin structure.

b. Intrusions in the Oldermass.

The higher part of the Kaikoura range is described by McKay §§ as intersected by a network of dykes, and igneous rocks are brought down by the streams in great quantities.

c. The Covering Strata.

The beds grouped under the name "covering strata" lie with marked unconformity upon the denuded surface of the previously folded oldermass. Their

* See, *e.g.*, P. Marshall, 'New Zealand,' *Handbuch der regionalen Geologie*, vol. 7, 1, pp. 15-21, and map, p. 10, 1911; and 'Geology of New Zealand,' p. 179, Wellington, 1912.

† J. Park, *Trans. N.Z. Inst.*, vol. **36**, p. 431, 1904; 'Geology of New Zealand,' p. 52, Christchurch, 1910.

‡ *N.Z. Geol. Surv. Bull.*, No. 12 (N.S.), p. 22, 1911.

§ 'Geology of New Zealand,' map. ‖ McKay, *Loc. cit.*, 1890, p. 116.

¶ McKay, *Loc. cit.*, 1886, p. 59.

** McKay, *Loc. cit.*, 1886, pp. 46, 47, 53–55, 59, 60; and 1890, p. 122.

†† F. W. Hutton, 'Reports Geol. Expl. during 1873–74,' p. 32, 1877.

‡‡ A. McKay, 'Reports Geol. Expl. during 1879–80,' p. 85, 1881.

§§ *Loc. cit.*, 1886, p. 47; 1890, p. 131. (See also J. Allan Thomson, 'Intrusions of the Tapuaenuku Range,' *Trans. N.Z. Inst.*, vol. **45**, 1913.)

limits as mapped by McKay (1890) are shown by a dotted line in Fig. 1. In the north-eastern part of the valley the series begins with conglomerate, upon which lies a thickness of several thousand feet of strata with marine Cretaceous fossils. These beds are chiefly mudstones with occasional intercalations of fine sandstone, while, towards the south-west end of the strip of covering strata, the Cretaceous beds are represented by sandstones and shales with plant fossils,* covered by a thick volcanic series. Since the writer has not visited that part of the valley, a description of the relief developed on that facies of the Cretaceous beds have necessarily been omitted.

Next follows, apparently with complete conformity, a stratum of unfossiliferous, hard, fine-grained, "lithographic" limestone (the Amuri limestone), the thickness of which, at one point, is estimated by McKay † at 2050 feet. Of this thickness nearly 1000 feet at the base has been replaced by flint.

The limestone in its upper part becomes more and more argillaceous, and passes up by a gradual transition into the Grey Marl with a thickness of a few hundred feet. The Grey Marl is the upper member of the Cretaceo-Tertiary system of Hector's Geological Survey, and no more definite statement of its stratigraphical position can at present be made. It is probable, however, that the work of the present Geological Survey will, in the near future, result in its correlation with some Tertiary horizon. The total thickness of the covering strata, up to this horizon, is estimated by McKay,‡ in the north-east part of the valley, as 12,000 feet. A revised estimate by Dr. J. Allan Thomson is expected to appear shortly.

The Grey Marl is followed by a coarse conglomerate § series, which is the highest member of the covering strata present, its upward limit being the reversed fault that brings it against the oldermass of the Kaikoura range. This is the "Post-Miocene Conglomerate" of McKay, who regards it as unconformable ‖ upon the Grey Marl with a discordance of dip.¶ In the gorge of the Mead, however, and, in fact, in all the sections examined by the writer, the dip of the conglomerate was found to be the same as that of the indulging series. The strike also is strictly parallel, not only with that of the Amuri limestone, but also, for a long distance, with the fault. This is strikingly brought out by McKay's map,** which indicates that, for a distance of 27 miles, one wall of the fault is formed by the conglomerate, a formation that is, throughout the whole distance, highly inclined, and nowhere more than a few hundred feet in thickness.

It is thus certain that, *within the area in which the covering strata are preserved*, the conglomerate was laid down upon a horizontal surface of the Grey Marl, and has participated in all the movements, whether of tilting or of folding, to which the lower members of the covering strata have been subjected. Since, however, the conglomerate contains an abundance of material derived from lower members of the covering strata, a like conclusion cannot be reached for the whole area originally occupied by those beds.

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* A. McKay, *Loc. cit.*, 1886, p. 102.

† A. McKay, *Loc. cit.*, 1886, p. 93. ‡ *Ibid.*, p. 94.

§ Perhaps more correctly "Fanglomerate." (See A. C. Lawson, *Bull. Geol. Soc. Am.* **23**, abstr., p. 72, 1912.)

‖ A. McKay, *Loc. cit.*, 1886, p. 95.

¶ *Ibid.*, section on p. 94; see also Hector, *Loc. cit.*, 1886, pp. xxxiv., xxxv.

** *Ibid.*, 1890, p. 96

d. Structure.

The structure of the oldermass is so obscure that no attempt has been made to indicate even its main outlines in Fig. 2, except in so far as it has been affected by the Orogenic uplift, which has folded the covering strata also. A generalized account of the structure of the covering strata has already been given in section B. The assumption that the surface on which the covering strata were deposited was one of very low relief was made for convenience in constructing Fig. 2, and is perhaps not warranted by facts of observation. Nothing, however, has been observed which would indicate that the assumption is false.

The folds in the back of Fig. 2 have been restored up to the horizon of the Grey Marl. The restoration was not made up to the surface of the "Post-Miocene Conglomerate," because the nature of the conglomerate leads to the belief that it never extended over the whole of the area represented. The same objection does not apply to the Grey Marl and underlying beds, the wide original extension of which has been satisfactorily shown by McKay * and Hector.†

The conception of the uplifts as anticlinal agrees with the observed facts and with the explanation of the structure given by Hector,‡ and the section across the valley (in Fig. 2), while necessarily diagrammatic, will be found to agree in general with the sections along the Dee and Mead rivers given by McKay.§ The great reversed fault is that described by McKay as the Middle Clarence Fault ‖ or Great Clarence Fault.¶

The restoration of the seaward Kaikoura anticlinorium in the left portion of the diagram is probably a fairly accurate representation of facts, but no account is taken of a possible thinning of the covering strata in that direction.

The restoration of the Kaikoura anticlinorium north-westward of the fault plane in the right portion of the diagram is offered with less confidence, for it is certain that a *pre-conglomerate* uplift of some kind, possibly of the nature of block faulting, must have affected an area *outside that in which the covering strata are preserved* in order to provide the material for the conglomerate, and it is probable that the movement affected at least a considerable portion of the rocks occupying the site of the Kaikoura range. This is the episode of local uplift towards the end of stage 2 referred to in section B. The nature of the movement being unknown, it was decided to ignore it in constructing the diagram. This portion of Fig. 2, however, while admittedly not representing all the facts, should prove helpful in explaining the post-conglomerate movements.

INŌ CHŪKEI AND THE FIRST SURVEY OF JAPAN.**

By E. B. KNOBEL.

It will not be uninteresting to record something of a remarkable man who alone undertook a survey more extensive in area than that of the whole British Isles, and who accomplished it so well, and, for his period, so

* A. McKay, *Loc. cit.* 1892, pp. 5–7.
† Sir James Hector, *Loc. cit.*, 1890, pp. xxxvi., xxxvii.
‡ *Ibid.*, 1886, pp. xiv., xv., and 1890, pp. xxxviii., liv.
§ *Ibid.*, 1886, pp. 94, 95.
‖ *Ibid.*, 1886, p. 130. ¶ *Ibid.*, 1892, p. 14.
** Substance of a discourse delivered to the Royal Astronomical Society.

accurately, that up to not many years ago his determinations of latitude and longitude were the only ones available for many places in Japan.

Inō Tadayoshi, commonly called Inō Chūkei, was born in 1744. From early manhood till about 1795 he was a brewer of saké. He was always greatly interested in astronomy, and in 1769 he observed the transit of Venus. He studied the motions of the sun and moon, and the method of calculating eclipses under Takahashi, the astronomer to the Shōguns. He became enamoured of the art of surveying, and in the year 1800, when he was 55 years of age, he petitioned the Shōguns to be allowed to make a map of his country at his own expense.

At this time no accurate map of Japan existed or had ever been made. Many navigators had made rough maps of the coast, all very crude and inaccurate, most of which may be seen in the great work on Japan by Count Teleki. The Jesuit fathers in the seventeenth century had made a map which gives a great many towns and some details, but the errors are so large and the configuration of the coast so incorrect, it is clear it was not based upon any scientific survey whatever. For instance, it makes the mainland extend over 15° of longitude instead of 12°. It must be remembered that Japan was a closed country from the time of the expulsion of the Jesuits till far into the nineteenth century. Sir Edward Belcher remarks (1841), "The coasts of Japan have not at any period been surveyed by competent persons, and the outlines of the main islands which we possess upon the authority of the Jesuits can only be reckoned as maps instead of charts."

In nine months Inō Chūkei made a rough map of the whole of Japan, including the northern island Hokkaido. He then commenced a more systematic and accurate survey, upon which he laboured unceasingly till the year 1818, though according to some accounts he did not complete it till 1821. In this work he had 13 assistants, including 4 pupils, and during this period he made 1135 determinations of the latitude and longitude of different places. The results are contained in 14 MS. volumes including 33 sheets of maps. These maps were found to be so good and so free from large errors that they were adopted as the basis of the more recent trigonometrical survey of Japan.

Inō determined the length of a degree of longitude in three latitudes as follows :—

35°=23·1	Ri
40°=21·6	,,
44°=20·285	,,

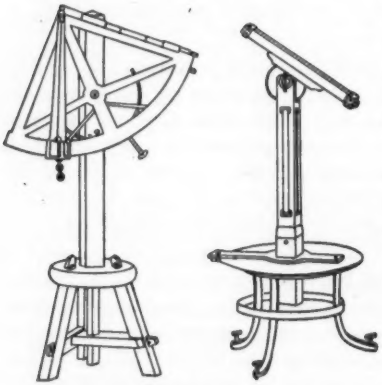
It is doubtful what the exact value of the Ri was at the period. It is stated that it varied in different provinces, but taking the value adopted by the Japanese Government 1 Ri=2·4403382 English miles=12,885 feet; then the length of 1 minute of longitude will be—

35°=4961	feet,	standard	value	4991
40°=4639	,,	,,	,,	4669
44°=4356	,,	,,	,,	4385

He is also said to have determined "the mean length of one degree of latitude," which I assume to mean the length of one degree of the mean latitude of Japan, as 28·2 Ri=6056 feet length of 1 minute. The mean latitude of Japan is 36°, and the standard value of 1 minute is 6066 feet.

The instruments he used were all of his own construction. They consisted of a quadrant, an azimuth instrument, and a compass.

The brass quadrant is 19 inches in radius, mounted on a wood frame, with a telescope fixed to one of the straight limbs; radial lines measure to thirds of a degree, and by means of a diagonal scale angles could be read to one minute.



INŌ CHŪKEI'S SURVEYING INSTRUMENTS.
(*Prof. T. Hayashi.*)

The azimuth instrument had a horizontal circular disc of copper 19 inches in diameter, graduated by radial lines into degrees. Passing through this disc was an upright wooden pillar carrying a telescope. This pillar rotates, carrying with it a horizontal rod resting on the graduated circle. There was also a diagonal scale by which azimuths could be read to ten minutes of arc. With this instrument Inō made a system of triangulation of prominent hills and landmarks; and from the measured distances the longitudes were calculated.

These instruments were in London three years ago, when they were exhibited at the Japan-British Exhibition at Shepherd's Bush, and the work they did was described by me at a lecture at that Exhibition. I carefully examined the graduations of the quadrant with a magnifier. It was beautifully engraved, the lines fine, clean, and even. There can be little doubt that it was entirely made by the Japanese. One had been led to suppose that these were the original instruments actually used by Inō, but I have since found that those were destroyed by fire sometime after 1821, and the instruments exhibited were exact copies made in 1828.

For measuring distances he used the primitive method of a rope, and a species of perambulator. The original compass he used was exhibited at Shepherd's Bush. At his period there appears to have been no magnetic declination in Japan, and the needle pointed true north.

Fortunately, the map of Japan made by Inō Chūkei is available to us through the efforts of the celebrated Von Siebold, to whom the world is indebted for so much information about Japan.

Siebold went to Japan in 1823, and in 1826 he made friends with the

court astronomer Takahashi, son of the man of the same name under whom Inō studied astronomy. From him Siebold bought two maps of the country, which in those days it was high treason to put into the hands of any foreigner. Two years later this was discovered. Takahashi was imprisoned and died during his trial, or he would have been beheaded. Siebold was imprisoned and had to do penance, and was banished the country in 1830, but he managed to save the maps. After his return to Europe the map was engraved with Chinese assistance, and it was published in 1841 under the title "Map of the Japanese Empire from the Original Maps and Astronomical Observations of the Japanese." * The name of Inō Chūkei does not appear on it, and indeed throughout Siebold's works the authorship and credit are given erroneously to Takahashi, and this error has been repeated by Count Teleki in his extensive work on Japanese cartography. Siebold published four facsimiles of the original MS. maps, which are of course in Chinese characters. I have carefully examined them and taken out the positions of some places, which is difficult on account of the absence of lines of latitude and longitude. The scale is about $3\frac{5}{8}$ inches to a degree of latitude. The maps show very full details. There is a list of marks and symbols attached to names to indicate whether the name is that of a province, a city, a river, a Buddhist or a Shinto temple, etc.

The engraved map is on a scale of $2\frac{1}{4}$ inches to a degree of latitude. From this I have taken out several positions and compared them with an excellent map issued by the Japanese Government.†

Longitudes.

	Inō.	Modern.	Diff.
	° ′	° ′	′
Tokyo	139 45	139 50	− 5
Kyoto	135 40	135 45	− 5
Nagoya	136 51	136 57	− 6
Nagasaki	129 52	129 54	− 2
Shimonoseki	130 54	130 57	− 3
Sendai	140 56	140 49	+ 7
Niigata	139 4	139 2	+ 2
Inuboesaki	140 48	140 52	− 4
Omasak	141 18	140 55	+23
Irosaki	138 49	138 54	− 5
Muratosaki	134 6	134 13	− 7

Inō's longitudes were measured east and west of Miyako (Kyoto) as origin. The above series of longitudes by Inō depend upon the Greenwich longitude assigned by Siebold to Kyoto, which is 5′ in error, consequently

* In the library of the Royal Geographical Society.

† The modern names of places in Japan differ in many cases from what are given in the map in question.

+5 ought to be added to all the above differences. This is eliminated in the following table :—

Difference in Longitude.

	Inō.	Modern.	Diff.
	° ′	° ′	′
Tokyo—Kyoto	4 5	4]˜ 5	0
Tokyo—Nagoya ...	2 54	2 53	+1
Tokyo—Nagasaki ...	9 53	9 56	−3
Niigata—Inuboesaki ...	1 44	1 50	−6
Irosaki—Muratosaki ...	4 43	4 41	+2

Latitudes.

	Inō.	Modern.	Diff.
	° ′	° ′	′
Tokyo	35 41	35 41	0
Kyoto	34 58	34 58	0
Nagoya	35 9	35 8	+1
Nagasaki	32 44	32 48	−4
Shimonoseki	33 58	34 3	−5
Sendai	38 17	38 16	+1
Niigata	37 59	37 53	+6
Inuboesaki	35 42	35 39	+3
Omasaki	41 33	41 31	+2
Irosaki	34 35	34 37	−2
Muratosaki	33 15	33 15	0

The above figures speak for themselves and require no comment.

When we consider that this remarkable man only started on his great survey at the age of 55 when his life was declining—that he surveyed 137,000 square miles, 16,000 square miles more than all the British Isles, using instruments antiquated and behind his time, and that his results were so good and reliable—the individual prowess of those who have laboured in the great surveys of Western countries pales its diminished fire before the devotion, perseverance, patience, and assiduity of Inō Chūkei, whose name must ever deserve a high place in the annals of cartography.

It is pathetic to read that he met with no reward in his lifetime, for on the termination of his work he was thrown into prison by the Shōguns, where he remained until he died in the year 1821. But when the happy era of the Meiji began in 1868, justice was at once done to Inō Chūkei; his works were immediately printed, and they were published in 1870; an Imperial order was subsequently conferred on the man long since dead, and a monument erected to his memory in the Shiba temples at Tokyo.

TROPICAL AFRICA, ON THE BORDER LINE OF MOHAMEDAN CIVILIZATION.

By Major C. PERCIVAL, Rifle Brigade.

ONE of the most remarkable figures in the more recent history of tropical Africa died in the autumn of last year; this was no other than Zobeir Pasha, the famous ruler and slave-dealer of the Anglo-Egyptian Sudan. He passed away with scant notice, yet his name will be preserved to us as much from the fact of his connection with Gordon Pasha, as from the fact that the site of his stockade has given the name of Dem Zubeir to the map of Africa. Although Zobeir Pasha and his following were routed by Gessi so long ago as the year 1872, it may be of interest to know that the burnt stumps of his stockade, and the mud walls of his houses continue to witness to his greatness in those far distant forests up to the present day.

Mention is made of this southern empire in 'A Tropical Dependency,' written by Flora Shaw (Lady Lugard), in 1905, and in the same book a conversation is quoted as having taken place between the authoress and the Pasha when he was a prisoner at Gibraltar. This conversation should have been of importance to all who are interested in Egyptology, as it stated that Zobeir Pasha had discovered "a system of temples hidden away in the caves of these remote regions, which equalled if they did not exceed in splendour those already discovered in Egypt."

Now it happened that the writer lived for more than a year on the exact spot previously occupied by Zobeir Pasha's zariba, and was connected with this district for three and a half years, during which time he had exceptional facilities to become acquainted with the people of the district, and in some cases with the neighbouring Sultans of the French Congo over which Zobeir Pasha also held sway. In spite of the fact that I was in daily touch with these people, no mention was made by them of the existence of caves until I commenced to make inquiries. In 1909 there were still living Sheikhs and headmen who had been subject to the Pasha or to his lieutenants, so that it was a simple matter to send for these men and to interview them.

Four sets of caves were reported as existing in a district of roughly 200 miles square. One of these was situated in the Mungaiyat hills of the Bahr-el-Ghazal, where "God had made the local cattle so small, that they could escape in the caves with their owners"; this they appear to have done unsuccessfully, as Zobeir Pasha conquered these people and slaughtered their cattle for food so that the breed no longer exists. In the other cases the caves are in the French Congo; Tekkima, father of the present Sultan of Zemio, lived with his people (probably his own family) in rock caverns of great extent. These caves possessed many openings, are a journey of five days south-east of Raga, and were well-known to the Koreish people of the Mungaiyat hills. The people used to fetch food from the inside and

give it to their visitors, but appeared to be chary of permitting them to enter.

Sultan Said Buldas, who belongs to a different section of the Koreish tribe, *i.e.* Koreish-Nakka, informed me that his people used caves in time of war when they were living in the French Congo. He had been inside the principal cave which was at Jebel Milla, a journey of about two days west and south of Katuaka (Jebel Miggi). This cave was entered at the side of the hill, and " by means of a slit or narrow passage up the inside, a watchman was enabled to come out on the top of the hill on to a rock from whence there was an extensive view of the surrounding country."

Sheikh el Hag Abba, Khalifa to Sultan Fertak of Raga, provided the closest evidence to Zobeir Pasha's story. As a young man he visited the late Sultan Senussi of Ndele, close to whose town " there is a cave of enormous size and extent which he entered (the size given was over a mile long). Inside the cave was a stream, bushes, and birds (probably bats) ; the echo of people walking on the outside of the hill, even of deer, could be heard inside. Old sleeping places and places for grinding the corn were also visible in the rock." Throughout the inquiry no mention was made of any paintings or sculptures, though the people were carefully cross-examined, and were shown pictures of an Egyptian temple which appeared about that time in an illustrated paper.

The whole of this forest country was subject to Zobeir Pasha, and as it was also the limit or the approximate limit of his eastern boundary, I think it safe to conclude that his story of temples was not founded on fact ; still no one can be too careful when judging of things in Africa. All visitors to the great Cairo Museum must remember the two granite sphinxes which face the entrance from the central hall. The guide book issued under the name of the Director General (Prof. Sir G. Maspero), contains the following notice :—" Le sphinx n'était pas, aux yeux des Egyptiens, la combinaison arbitraire d'un corps de lion et d'une tête humaine : il était, même pour les savants de l'époque gréco-romaine, la représentation d'un animal authentique, d'espèce rare il est vrai, mais qu'on rencontrait quelquefois dans le désert de Libye et en Ethiopie. La réunion chez un même être de la force du lion et de l'intelligence humaine le rendait particulièrement redoutable ; aussi fit-on de lui un dieu, Harmakhouîti, Hakmakhis, etc. . . ."

Now it may be news to many to hear that not only does this sphinx or mythical lion still live in the minds of people, though in a slightly altered form, but it is still worshipped in the eastern district of the Bahr-el-Ghazal by the Koreish-Aja tribe of which the Sheikh Miriki, an ex-bazinga of Zobeir Pasha, is the head. Strange as it may sound, it is a fact that in the year 1908, I was present in these villages during the rains ; the river Boro came down in spate, and the villagers sacrificed a white cock to propitiate the river-god.

Further interesting facts were given to me about the river-god : " The god was a lion, Dud, in the common Arabic of this part ; it lived entirely

SHEIKH, FORMERLY SULTAN MIRIKI OF THE RIVER BORO.

RIVER BORO IN FLOOD. GOVERNMENT FERRY-BOAT WITH BAGGAGE.

DAWN IN A KOREISH VILLAGE.

A VIEW IN THE MUNGAIYAT, SOUTH OF RAGA.

in the water, and was of immense strength, so that it was impossible to release anyone whom it seized except through the medium of sacrifice." In order to avoid this, two sacrifices were made yearly by the villagers, one at the commencement of the rains at the time when the river first came down in flood, and the second at the time when the river commenced its final fall. An instance was given of one of the government police, who, previous to his enlistment, was seized in midstream by the god and held there until the necessary sacrifice had been made. This man was with me for some years, and appeared none the worse for his adventure.

In the book to which I have already referred, mention is made not only of demons (possibly sphinxes) in the desert to the north-east of Timbuktu, but also of the legends connected with the founding of the great African Empire of Songhay in 700 A.D. by a stranger from the east who killed the "river-god" and took its place in the affections of the people. Another later reference to the "Dodo," or fetish lion, is associated with the Hausa city of Kano in Northern Nigeria and brings us down to the tenth century. In this case "a strong man killed the fetish lion and founded the town." We have, therefore, the legend of the river-god or "dodo" recorded in Arabic literature of the western Sudan and dating from the earliest times, while in 1908 we still find the same beast, the "dud," treated as a god and worshipped in the eastern Sudan. This is not really a matter for great astonishment when it is remembered how slight are the changes which have taken place in the customs of the desert tribes in Arabia or in Africa since remote times, or since the writing of the Old Testament. Are not the chain armour and the cross-hilted swords of the Crusades or copies of them still worn and carried in the Sahara ?

Two further instances of ancient customs have come under my notice, and are worth relating here. In the fourteenth century when the African historian Ibn Batuta made his journey across the desert from Morocco to the Niger he relates how "water was stored in trees by the people," this custom is still common in Kordofan to this day. The tree is the Banian or Tebeldi tree (*Adansonia digitata*); it is hollowed out when necessary, and is in some cases mended with bricks and cement. The trees are filled up by the Arabs during the rains, and are a source of income to their owners through the sale of the water to travellers. The same traveller, Ibn Batuta, mentions the keeping of bees in hollow trees for the sake of the honey. This is a common practice in the Sudan, where hollow trunks, stopped with mud, are placed in trees by the natives with a view to attracting the bees for the sake of their honey.

My last note deals with the "beating of boundaries." We find this custom in vogue in England, where from time to time the boundaries of the City Wards have been beaten with some ceremony; while only this year the borough of Westminster decided to revive this ancient custom within their limits. But all this has its prototype in distant Africa.

I have twice been present and have assisted at the beating of boundaries in the eastern portion of the Bahr-el-Ghazal province, where on the border line of savagery and civilization this custom is a yearly practice. Here on the occasion of the Arabic New Year the people beat the walls of their huts, the grass thatches, and the hosh walls (a hosh is the ground and houses contained by a boundary wall, in this part of Africa the walls are made of grass or weeds) to drive away the devil or evil spirits. At the same time they extinguish the old fires and bring in new ones. The beating is accompanied by the firing of guns, the shouting of men, and the "lulu-ing" of women.

My diary contains the following entry under Tuesday, February 2, 1909: "Purification of the Blessed Virgin Mary . . ."; "Village went mad for half an hour over advent of Arabic New Year." This took place at Raga, the centre of Mohamedanism in this district, a town where on certain festivals the people proceed to the river to wash and to pray.

There is little doubt in my mind that our custom had its origin in the East. I wish to state that I am indebted to Lady Lugard's book for my Arabic dates, as I have not had the opportunity of reading the "Tarikh-el-Sudan," and other Arabic historians.

STATISTICAL STUDY OF WHEAT CULTIVATION AND TRADE, 1881–1910.*

By J. F. UNSTEAD, M.A., D.Sc.

ITALY.

TABLE XVII.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushel.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	(*11·3*)	(*10*)	118	15	23	0	126	4·3	18
1891–00	*11·3*	*11*	123	15	22	0	130	4·1	17
1901–10	12·2	13	163	16	38	0	185	5·5	21

Except in regard to the acreage and yield per acre of the earlier years, the statistics appear to be trustworthy. There was little change during the nineteenth century, but in the twentieth century an increase characterized all the conditions.

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* Continued from p. 181.

BULGARIA.

TABLE XVIII.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	(2·4)	(15)	(35)	(3)	6	(17)	0	(26)	(10·4)
1891–00	(2·4)	(15)	35	(3)	11	31	2	21	6·2
1901–00	2·4	15	35	3	11	31	12	21	5·2

The statistics for the first period can be used only in getting world totals, the figure of 10·4 bushels as the consumption per head being specially open to question. The most important facts are that the yield per acre is rather higher than in any other country in southern or eastern Europe with the exception of its neighbour Roumania, and that about one-third of the total harvest is exported.

SERVIA.

TABLE XIX.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	(0·5)	(12)	(6)	1	(2)	(33)	—	(3)	(1·6)
1891–00	0·8	12	10	1	3	30	—	6	2·6
1901–10	0·9	12	11	1	3	27	—	7	2·6

Here again the statistics cannot be considered trustworthy, except for the last years of the period.

GREECE.

TABLE XX.

Period.	Produce.	Net import.	Consumption.	
		Wheat and flour.	Total.	Per head.
	Million bushels.	Million bushels.	Million bushels.	Bushels.
1881–90	(5)	—	—	—
1891–00	(5)	4	(9)	(4)
1901–10	(7)	7	(14)	(5)

These are the only estimates which can be obtained, and the only facts which may be safely deduced from them are that the production of wheat is only about half of the required quantity, and that the import is increasing.

TURKEY IN EUROPE.

TABLE XXI.

Period.	Produce.	Net import.		Consumption.	
		Wheat.	Flour.	Total.	Per head.
	Million bushels.	Million bushels.		Million bushels.	Bushels.
1881–90	(30)	—	—	—	—
1891–00	(24)	(0·5)	(3·5)	(28)	(5)
1901–10	(24)	(0·5)	(4·5)	(29)	(5)

Little trust can be placed in these estimates, and the only additional statement that can be made is that the yield is low, possibly not more than 8 bushels per acre.

ROUMANIA.

TABLE XXII.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	(3·4)	(12)	(42)	(5)	21	(50)	2	(16)	(3·4)
1891–00	3·7	14	52	6	27	52	4	19	3·5
1901–10	4·4	17	73	7	42	58	5	24	3·7

These figures are noteworthy as showing a marked increase under every heading; in the important respects of area, yield per acre, total production and net export, the rate of increase has become greater during the latter part of the period.

BELGIUM.

TABLE XXIII.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	0·6	30	18	1	21	10	38	6·4	55
1891–00	0·5	33	16	1	34	3	49	7·5	69
1901–10	0·4	35	13	1	46	0	58	8·1	80

The uncertainty in regard to the acreage and yield per acre is due to the peculiar methods of publishing returns, for previous to 1900 the area was reported decennially, and the production of the successive years was given, not as an

absolute amount, but as the rate of the yield upon the area last reported. The probable error is, however, small, and the decrease in acreage and increase in yield shown here are great enough for the main facts to be accepted. It will be observed that because of the decline in production and the increased demand for wheat, Belgium has rapidly increased its dependence upon foreign supplies.

HOLLAND.

TABLE XXIV.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Million bushels.	
1881–90	0·2	27	6	—	11	?	17	4·0	65
1891–00	0·2	28	5	—	15	44	20	4·2	75
1901–10	0·1	33	5	—	20	50	25	4·5	80

A comparison between Holland and the British Isles shows that, although the figures for the former country are smaller than those for the latter, very similar developments have occurred in regard to the acreage, the yield per acre, the total production, the net imports and the proportion of supplies obtained from abroad. The chief differences are that the consumption per head is greater in Britain, and that the proportion of flour in the imports is greater in Holland and is still increasing. It is worthy of note that whereas half the import into Holland is in the form of flo r, no flour is now imported into Belgium; the explanation probably lies in the fact that whereas both grain and flour are duty-free in Holland, in Belgium only grain is free, and there is a duty of 2 francs per 100 kilogrammes upon flour.

It is to be observed that the consumption of wheat per head in Holland is intermediate between the great amounts used in France and Belgium to the west, and the lower amounts used in Germany to the east, while those of Russia, further to the east, are still lower.

SWITZERLAND.

TABLE XXV.

Period.	Produce.	Net imports.		Consumption.		
	Total.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	*3*	12	8	*15*	*5·2*	*80*
1891–00	*4*	15	11	*19*	*5·9*	*80*
1901–10	*4*	17	12	*21*	*5·1*	*80*

It is regrettable that there are merely estimates of production and scarcely any estimates of area; it is therefore almost hopeless to attempt an estimate of the yield per acre.

DENMARK.

TABLE XXVI.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	(0·1)	(27)	4	—	0	—	4	2·0	0
1891–00	(0·1)	(30)	4	—	2	0	6	2·6	33
1901–10	(0·1)	(35)	4	—	4	0	8	3·0	50

The uncertainty as to the area under wheat makes it impossible to make any exact statement as to the yield per acre; it is only certain that it is very high. A return relating to the year 1896 puts the yield at over 40 bushels; this estimate has gained considerable currency, but those for other years show that it was exceptionally high and cannot be accepted as indicative of the normal yield. It should be noticed that while in the first period the country produced all the wheat it required, during the last period half the supply had to be imported, owing largely to the increased consumption per head.

INDIA.

TABLE XXVII.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per acre.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	*26·7*	*10*	*259*	*40*	33	*13*	?	*186*	*0·7*
1891–00	*25·2*	*10*	*243*	*38*	23	*9*	6	*182*	*0·6*
1901–10	*26·0*	*11*	*294*	*39*	37	*13*	6	*218*	*0·7*

The statistics of acreage and production are issued annually, but owing to the difficulties of collecting the returns, especially in the Native States, there is an appreciable margin of error, indeed successive issues of the same official publication give figures for the same year which may vary from one another by as much as 10 per cent. The error, however, is not great enough to invalidate such statements as that the production fell somewhat in the earlier portion and rose to a greater extent during the later portion of the period. This statement is borne out also by the trade returns which recorded similar changes in the exports. The greater part of the harvest is required for home consumption, the surplus for export being relatively small; as the home consumption tends to increase with the population it is not likely that the export will become much larger in the near future. Moreover, the consumption per head is very small, and this indicates much greater demand for other food-stuffs (*e.g.* millets and rice) which will prevent the acreage under wheat being increased to any marked degree, except by the

extension of irrigation which may bring new land into cultivation in the drier areas.

JAPAN.

TABLE XXVIII.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	1·0	13	13	2	0	—	11	0·3	0
1891–00	1·1	17	19	2	1	100	18	0·4	6
1901–10	1·2	17	20	2	5	70	23	0·5	22

The area under wheat in Japan is steadily increasing, and is now more than two-thirds that in Britain; in each country about 8 per cent. of the arable land is now under wheat. With an increased yield per acre there has resulted a substantial increase in the total production. On the other hand, the population has become greater and also the consumption per head has steadily increased, so that the greater production has not been able to meet the demand, and importation has begun; at present nearly a quarter of the total supply is imported. The amounts, however, are small, for in this country wheat plays but a minor part as a food-stuff.

CHINA.

There are no statistics of any value as to the production of wheat in China, the only figures being those of the import from other countries. These show that there has been a very small but increasing import of flour, equivalent to 2 million bushels of grain in the first period and rising to 4 and 6 million bushels in the second and third periods. There is therefore as yet no statistical indication of any marked development of the Chinese as a wheat-eating people.

PERSIA.

The few estimates of production in Persia that have been made cannot pretend to accuracy, but they give averages of 22 million bushels for the first period, and 19 and 16 million bushels for the second and third periods respectively. There appears to be a small export which is occasionally replaced by an import. The population is probably about 9 millions, so that the consumption per head would be between 1 and 2 bushels.

TURKEY IN ASIA.

The estimates of production seem to indicate that about 35 million bushels of wheat may be regarded as a normal production and that the amount was higher, say 45 million bushels, in the earlier decades. In good years there is an export which may amount on the average to about 3 million bushels. With a population estimated at 17 millions, this indicates a consumption at the present time of rather less than 2 bushels per head.

UNITED STATES OF AMERICA.

Before discussing the facts shown by the statistics relating to the United States, it is necessary to examine their reliability. It will be observed that the figures in Table 31 which give the acreage and production, and also those derived from them, are in italic type to indicate that they are only estimates. Throughout the whole period official returns of acreage and production have been issued, but they must be accepted with reserve; it has even been necessary to modify those of the second period.

Two separate departments have been charged with the duty of collecting and publishing agricultural statistics: the Department of Agriculture has issued returns, both monthly and annually, and the Census Bureau has issued the results of independent investigations once in each ten years, viz. in reference to the years 1889, 1899 and 1909.

In regard to the year 1889, the Census returns were slightly below those of the Department of Agriculture, but there are no data to enable one to decide between them, and as the figures of the Department of Agriculture have to be used for the other years of the decade they are retained for this year also.

Towards the end of the period 1891–1900 the figures of the Department of Agriculture were questioned by commercial statisticians, and when the Census returns relating to 1899 were issued they were found to differ most seriously from those of the Department of Agriculture. The discrepancies were great in the totals for the whole country and they were not uniform throughout the States. The following examples relate to the production of wheat in the country as a whole and in those states where the discrepancies were greatest:—

TABLE XXIX.—Production of Wheat in 1899 in Millions of Bushels.

	Census Bureau.	Department of Agriculture.
United States	659	547
Minnesota	95	68
Ohio	50	40
Indiana	35	25
Missouri	23	11
Michigan	21	13
Illinois	20	13

In regard to almost every state the figures published by the Department of Agriculture were less than those published by the Census Bureau. It is unnecessary to detail the controversies which followed; * it is sufficient to say that the figures of the Census Bureau seem to have been approximately accurate, that those of the Department of Agriculture were obtained by statistically unsound methods, and that the estimates of the Department of Agriculture for the year 1900 were brought considerably more into harmony with those of the Census Bureau. Yet the Census returns related to the year 1899 only, and it is therefore necessary to utilize the figures of the Department of Agriculture and to make from them some estimate of the true amounts. For this purpose a few facts as to the statistical methods of the Department must be stated. The country was divided up into a large number of districts in each of which the Department of

* The whole matter is exhaustively examined in a series of articles in vol. 11 of the *Journal of Political Economy*, Chicago, 1903.

Agriculture had an unpaid correspondent; 85 per cent. of the correspondents were farmers who had a direct interest in keeping estimates low so that prices might be high, and the chief statistician of the Department admitted that they had "never been known to report the condition higher than it really was." Undoubtedly, understatements were the common result of the system. This became even more serious because of the methods of calculation by which each error became accentuated, one might almost say increased with interest, from year to year. At the preceding Census, that of 1889, the actual area was found by a farm-to-farm inquiry by disinterested officials of the Census Bureau. The correspondents of the Department of Agriculture were instructed to report the acreage of the next year, 1890, as a percentage of this area and also to estimate the yield per acre. The acreage thus obtained was issued as that of 1890, and that of the next year was again estimated as a percentage of this. So year after year no actual enumeration was made, only a comparison with each preceding year. Thus, if the first percentage was put too low it would affect all the subsequent returns, and a second underestimate would be added to it and similarly become permanent. For example, if the first estimate were 5 per cent. below what it should be, an area of 100 acres would be given as 95; if in the second year the same understatement were made, the area would be given as 95 per cent. of 95 per cent., *i.e.* about 90 acres instead of 100 acres, and in the third year by the same understatement it would come about 86 acres. Consequently the average appeared as far too small in those districts where the correspondents were prejudiced by their own or their neighbours' interests. Also, as the production was estimated by the yield upon this acreage it was similarly understated.

Apparently this evil had not arisen in the preceding years, for in 1889 the estimate of the Department of Agriculture was slightly above that of the Census Bureau. If, then, in 1890 the Department's figures were rather smaller they were probably not far from the real facts, and for the ensuing years they have been amended in the following way. Assuming that the Census figures of 1899 were correct, there was a discrepancy of 112 million bushels between them and those of the Department of Agriculture. If this had gradually accumulated during the ten years, the difference would be 11 million for the year 1890, 22 million for the year 1891, 33 million for the year 1892, and so on. These differences were therefore added to the figures of the Department so that by 1899 the final estimate agrees with the Census return. The actual figures are given below:—

TABLE XXX.—Estimates of production in the United States, 1891-1900 (million bushels).

Year.	Department of Agriculture.	Census Bureau.	Actual differences.	Estimated differences.	Adjusted estimates.
1891	612	—	—	22	634
1892	516	—	—	33	549
1893	396	—	—	45	441
1894	460	—	—	56	516
1895	467	—	—	67	534
1896	428	—	—	79	507
1897	530	—	—	90	620
1898	675	—	—	101	776
1899	547	659	112	112	659
1900	522	—	—	—	522
Average ...	515	—	—	—	576

It will be observed that as the figures for the year 1891 were the second set obtained from those of 1899, the estimated difference is put at 22 million bushels. Also those of the year 1900 are left unchanged, as they had been re-adjusted, and it is probable that as a result of the inquiries the subsequent estimates were approximately correct. The acreages have been estimated in the same way, and the yield per acre computed from these estimates.

Although this method of adjusting the estimates has been devised to deal with the United States as a whole, it cannot be safely applied to the individual states, where local conditions brought about considerable divergences from what may be considered the common system of understatement. Consequently, the estimates of the production in groups of states during the period 1881–1890 have been entirely rejected and omitted from the analysis which follows.

For the year 1909 the two inquiries gave the following result:—

	Area. (Million acres.)	Production. (Million bushels.)
Census Bureau	44·3	683
Department of Agriculture ...	46·7	737

The difference is rather less than half that in 1899, but here, as in 1889, the Census returns are the lower. At present the discrepancy cannot be explained, and the series of returns issued by the Department of Agriculture for the whole decade has been used to obtain the averages, but these are again given in italic type to indicate the doubt that rests upon them.

As the final step in preparing the figures it has been necessary to reduce all the estimates of production and yield and all the returns of trade by $\frac{1}{33}$, as the American or "Winchester" bushel is $\frac{32}{33}$ of the British or "Imperial" bushel.

TABLE XXXI.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.				
1881–90	*37·1*	*12*	*427*	*54*	116	*27*	38	*257*	*4·5*
1891–00	*43·1*	*13*	*559*	*63*	178	*32*	40	*318*	*4·6*
1901–10	*47·4*	*14*	*657*	*69*	125	*19*	48	*463*	*5·6*

The change which seems to be of the most importance as affecting future conditions is that shown by the statistics of net exports. These increased in the earlier part of the period, but decreased in the later part, and to such an extent that the export was little more at the end than at the beginning of the period in spite of a very much greater production. This was, of course, owing to a rapid increase in the home demands, due partly to the growth of the population and partly to an increased consumption per head. In regard to the apparent increase of a bushel more per head in the third period than in either the first or the second periods, two points may be noted. The first is that the consumption is still lower than that in Canada or Britain, and this may doubtless be related to the fact

that many of the immigrants have come from countries where wheat is not so important a part of the food. The second point is that the increase in the consumption may be rather less than the statistics suggest, as there has recently been a development in the preparation and export of patent foods partly or wholly made from wheat. The amount of wheat used in this way cannot be ascertained, but an allowance for it would add somewhat to the exports and so reduce the amount consumed in the country.

The fall in the percentage of the harvest which is exported is so marked that the time may not be far distant when the United States may need all its production to satisfy home demands. The factors which make one hesitate to speak definitely on this subject are that the introduction of dry-farming is likely to bring into cultivation areas which until quite recently were thought useless for wheat, and that the work of scientific investigators in the many experimental farms and agricultural colleges has not yet had time to affect the work of the ordinary farmers, as it undoubtedly will do in the course of the next decades.

The United States cover so large an area that in discussing the problems of acreage and production some sub-division is desirable, and so the constituent states have been divided into the following groups. The Western or Pacific group includes the states lying wholly to the west of the Rocky mountains, viz. Arizona, California, Idaho, Nevada, Oregon, Utah, and Washington; the wheats of this region are mainly those known as soft white wheats. The West Central group of states includes those of the Rocky mountains and the Great Plains, with the Prairies and the southern states west of the river Mississippi, viz. Arkansas, Colorado, Indian Territory, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, New Mexico, North and South Dakota, Oklahoma, Texas, and Wyoming; the chief wheats are the hard spring and hard winter varieties and the durum wheat of the drier districts. The East Central group includes those between the river Mississippi and the Appalachian mountains, viz. Alabama, Illinois, Indiana, Kentucky, Michigan, Mississippi, Ohio, Tennessee, and Wisconsin; the wheats are largely semi-hard winter varieties in the north, and softer varieties in the south. The Eastern or Atlantic group includes the Appalachian and Atlantic states, viz. Connecticut, Delaware, Georgia, Maine, Maryland, New Hampshire, New Jersey, New York, North and South Carolina, Pennsylvania, Vermont, Virginia, and West Virginia; the wheats are mainly soft varieties.

These groups of states are so arranged because they produce characteristic varieties reflecting climatic differences, and because they have gone through different stages of development during the period considered.

TABLE XXXII.—Production by Groups of States.

Period	Area.				Yield.				Produce.			
	Million acres.				Bushels per acre.				Million bushels.			
	W.	W.C.	E.C.	E.	W.	W.C.	E.C.	E.	W.	W.C.	E.C.	E.
1881–90	4·1	14·2	13·4	5·5	13	11	12	10	55	160	157	55
1901–10	4·2	28·6	9·2	5·3	18	13	14	14	76	378	131	72

In the Western group the amount of land under wheat has scarcely increased at all, while the yield per acre and consequently the production have increased greatly. But there has actually been a great change in the area sown with wheat, for whereas in the first period the greater part of it was in California, in the last

period the Californian area had decreased to about half of its former extent, while that of the north, mainly in Washington, correspondingly increased and exceeded California in importance. Moreover, as the yield per acre has throughout been considerably greater in the north than in the south, the average yield stood much higher in the later period. This, however, is only a partial explanation of the higher average yield: a comparison of the yields of the two periods of individual states shows that there has been an actual increase in the productivity of the soil.

In the West Central group practically all the extension of acreage of the United States has taken place—indeed, were it not for this region the total acreage would have shown a decline.

At the beginning of the first period the amount of wheat land in the two Dakotas (then forming one "Territory") was less than one-tenth what it was at the end of the last period. This westward extension of cultivation is still in progress, and with the extension of irrigation and dry-farming, the Dakotas and Nebraska, with the still drier states of Montana, Wyoming, and Colorado, will assume increasing importance. As in the newer and drier lands of this region the yield per acre is usually lower than that in the earlier cultivated and better watered portions, the increase of 2 bushels in the average yield per acre is quite significant.

In the East Central group of states there has been a great decrease in the acreage, and as the lands least suitable for wheat are those likely to be withdrawn, the increase of 2 bushels in the average yield per acre does not indicate the same improvement in cultivation as it does in the West Central group. As regards the total production, in the first period the prairie states lying east of the Mississippi were practically as important as those lying west of the river; in the last period the eastern area produced little more than one-third that of the western area. As a whole, the East Central group has now reached a stage corresponding with that of the United Kingdom a few decades ago; it is rapidly becoming manufacturing and commercial rather than agricultural, and in its agriculture there is proceeding the transition from grain-growing to dairy-farming and market-gardening which accompanies an increasing density of population.

The Eastern group of states appears to have passed through this stage to the more settled condition which the United Kingdom seems also to have reached. The acreage no longer diminishes rapidly; the lands remaining under wheat are better cultivated and consequently the yield per acre has markedly increased. Indeed, in the case of the eastern United States there has been an actual increase in the total production. The most productive states are Maryland and Pennsylvania, presumably the south-eastern lowlands of the latter which adjoin Maryland, and it is to these states that the increase in production is mainly due.

DOMINION OF CANADA.

TABLE XXXIII.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	2·3	16	38	3	2	7	0	33	7·2
1891–00	3·1	18	55	4	13	24	20	38	7·3
1901–10	5·9	19	110	9	42	38	19	59	9·4

The recent increases in the acreage, yield, production, and exports are shown quite clearly by the table; it is necessary to draw attention only to the apparent sudden increase of 2 bushels in the consumption per head. Having regard to the already high figure, it seems unlikely that this increase has actually occurred, and as the harvests are not likely to be overestimated (*cf.* the experience of the United States in this respect), while the amounts of the exports are quite systematically obtained, the suggestion is that there is a certain amount of wheat neither exported nor used as human food, but fed to cattle. This is the more likely to be the case, because with the rapid increase of production there has been difficulty in the far west in transporting the wheat to the European markets; the only direct evidence as to the feeding of cattle with wheat which the writer has come across is a statement made in 1904 by a Canadian official that the farmers were then using 20 million bushels of wheat for this purpose. This estimate is doubtless too high; if 12 million bushels were accounted for in this way the consumption per head would be equal to that of the previous periods. The suggestion made in regard to the United States, that wheat is used in patent or prepared foods, and should be added to the export, does not apply to Canada.

Canada, like the United States, extends across the whole continent, and so has been divided in the same way into four regions. The Western or Pacific region is formed by British Columbia; the West Central division is composed of the provinces of Alberta, Saskatchewan, and Manitoba; the East Central division is formed by Ontario; the Eastern division comprises Quebec, Prince Edward Island, New Brunswick, and Nova Scotia. The following table shows the development in each division during the whole period:—

TABLE XXXIV.—Production by Groups of Provinces.

Period.	Area.				Yield.				Produce.			
	Million acres.				Bushels per acre.				Million bushels.			
	W.	W.C.	E.C.	E.	W.	W.C.	E.C.	E.	W.	W.C.	E.C.	E.
1881–90	0·0	0·5	1·5	0·3	—	16	17	14	0	8	26	4
1891–00	0·0	1·5	1·3	0·3	—	17	19	16	0	25	25	5
1901–10	0·0	4·8	0·9	0·2	—	18	22	17	0	87	20	3

Wheat cultivation in British Columbia is at present negligible, and is, therefore, in marked contrast with that on the southern side of the international boundary. The West Central division is by far the most important in Canada, as it is in the United States, and it is to the increase in this part of Canada that the growing importance of the Dominion as a source of wheat is due. Table XXXV. analyzes still further the recent growth in this division:—

The extraordinarily rapid increase in Saskatchewan has quite reversed the relative position of this province and Manitoba during the ten years. The rather greater yield per acre in the drier west than in the better watered east is exceptional, but the considerably greater yield in this division as a whole (18 bushels per acre) than in the corresponding divisions of the United States (13 bushels per acre) is in accord with the general rule that the yield is higher in the more poleward areas.

The areas now under cultivation in this part of Canada form only a small proportion of those which may be utilized when extended means of communication and a larger population enable the wheat lands to extend to the boundaries

set by climatic and soil conditions. An attempt was made by the writer in a recent paper in this Journal * to demarcate the area which may thus be utilized, and if this estimate is correct the high yield per acre should make the ultimate

TABLE XXXV.—Production in Alberta, Saskatchewan, and Manitoba, 1901–1910 (million bushels).

Year.	Alberta.	Saskatchewan.	Manitoba.
1901	0·9	12·0	50·5
1902	0·9	13·1	53·1
1903	1·2	15·1	40·1
1904	0·9	15·9	39·2
1905	2·3	26·1	55·8
1906	4·0	37·0	61·3
1907	4·2	27·7	39·7
1908	7·1	50·7	49·3
1909	8·5	90·2	45·8
1910	7·9	72·7	39·9
Mean ...	3·8	36·0	47·5
Average yield per acre	(Bushels) 19	(Bushels) 18	(Bushels) 17

production in Canada as great as that to which the United States may attain. Thus the present state of wheat cultivation in the West Central division may be regarded as only the beginning of a development of the greatest importance.

In the East Central and Eastern divisions the decline in acreage has been so great that in spite of an increased yield per acre the production has fallen.

The four divisions of Canada broadly correspond with the four divisions of the United States, and so the statistics have been combined in the following table, upon which further comment is unnecessary.

NORTH AMERICA.

TABLE XXXVI.—Production by Groups of States and Provinces.

Period.	Area.				Yield.				Produce.			
	Million acres.				Bushels per acre.				Million bushels.			
	W.	W.C.	E.C.	E.	W.	W.C.	E.C.	E.	W.	W.C.	E.C.	E.
1881–90	4·1	14·7	14·9	5·8	13	11	12	10	55	168	183	59
1901–10	4·2	33·4	10·1	5·5	18	14	15	14	76	465	151	75

MEXICO.

There are no accurate statistics of wheat cultivation in Mexico, but the estimates of the Department of Agriculture of the United States lead to the conclusion that the average annual production during the period 1901–10 was

* *Geographical Journal*, April and May, 1912.

about 10 million bushels, and during the two preceding periods was about 12 million bushels. No estimates of acreage have been made. The country appears to be practically self-supporting, for only about 1 million bushels are imported annually. On these figures the consumption per head would be less than 1 bushel per annum.

ARGENTINE REPUBLIC.

TABLE XXXVII.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	*2·0*	*12*	*24*	2	4	*17*	0	*18*	*6·0*
1891–00	*5·7*	*11*	*65*	6	37	*57*	5	*22*	*5·4*
1901–10	12·0	11	130	12	84	65	7	34	6·5

The developments in Argentina in regard to acreage, production and export are even more marked than those in Canada. The importance to which the cultivation and export of wheat have already attained will doubtless be increased both by a large extension of the acreage and also by a rise in the yield per acre. This is at present low, owing largely to economic and other human factors, but there is nothing in the climatic or soil conditions to prevent a great improvement.

URUGUAY.

TABLE XXXVIII.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	*(0·4)*	*(10)*	*(4)*	1	0	—	—	*(3)*	*(5)*
1891–00	*0·6*	*10*	*6*	1	2	*33*	32	*3*	*4*
1901–10	*0·7*	*10*	*7*	1	1	*15*	15	*5*	*5*

In Uruguay, pastoral work and its derivative industries are of much greater importance than the cultivation of the soil, and the country does little more than supply its own needs in regard to wheat. A change in the relative prices of wheat and animal products might bring about corresponding changes in the use of the land, but the rainfall is greater here than in the neighbouring portions of Argentina, and favours the growth of grass rather than the ripening of wheat.

CHILI.

TABLE XXXIX.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	(0·9)	(13)	(12)	1	4	(33)	8	(7)	(2·8)
1891–00	(1·0)	(14)	14	1	4	30	5	9	3·2
1901–10	1·1	14	16	2	2	13	7	12	3·7

As in North America, so in South America, wheat cultivation in the regions on the Pacific side of the Western Cordillera is unimportant compared with that in the East. The production in Chili is small, and is increasing so slowly that the exports are diminishing, and the country may soon cease to be self-supporting in this respect. The milling industry seems to be but little developed either here or in the Argentine Republic.

ALGERIA.

TABLE XL.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1891–00	3·2	8	24	5	2	8	0	17	4·0
1901–10	3·3	10	33	5	4	12	2	24	4·8

Only for the last two periods are the statistics obtainable. An increase in production seems due almost entirely to a higher yield per acre; it has made possible a greater consumption per head and an increased export—practically all of which goes to France.

TUNIS.

Tunis is of much less importance than Algeria. It appears to have produced 6 and 7 million bushels during the last two periods respectively, on an area little more than 1 million acres. There has been an export of about 1 million bushels to France, but smaller amounts have been imported from Russia.

EGYPT.

TABLE XLI.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	(1·2)	(10)	(12)	2	0	—	(10)	(1·3)	0
1891–00	(1·3)	(10)	(13)	2	1	100	(12)	(1·3)	(8)
1901–10	1·3	(15)	(20)	2	6	94	(24)	(2·2)	(25)

The chief facts are that in the last period a great rise in the yield per acre resulted in a much greater production, but the demand increased so greatly that a considerable amount, mainly in the form of flour, had to be obtained from abroad.

UNION OF SOUTH AFRICA.

TABLE XLII.

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1906–10	0·5	6	3	—	8	30	11	2	73

Statistics regarding the states now forming the Union of South Africa are so fragmentary that it is possible to make a table only for the last few years. From this it appears that the production of wheat is very small, and of the 3 million bushels about 2 million come from the Cape of Good Hope, and half a million bushels both from the Orange Free State and also from the Transvaal. In view of the climatic conditions, and the possibility of applying the new methods of dry-farming to the Veldt, it seems likely that the cultivation of wheat will be considerably extended. It may be suggested that the small amount consumed per head should be correlated with the fact that of the 5½ million inhabitants only about 1 million are of European origin.

COMMONWEALTH OF AUSTRALIA.

TABLE XLIII.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	3·2	8	27	5	6	22	15	16	5·7
1891–00	4·1	7	30	6	6	20	5	18	5·1
1901–10	5·7	10	56	8	28	50	18	20	4·9

The developments in Australia are much less important than those in Canada. The average yield per acre is extraordinarily low, partly on account of the occasional lack of rain which in certain years lowered the harvest in a way unknown in the northern hemisphere. Thus, in New South Wales the harvest of the years 1901–2 amounted to nearly 15 million bushels, that of the succeeding year fell to less than 2 million bushels, while the next harvest rose to 27 million bushels. The last decade saw an improvement in the yield, and as this was accompanied by a considerable extension of the acreage, the production increased sufficiently to allow a substantial export. Yet, on the other hand, the consumption per head has steadily decreased, and must be regarded as low.

Of the six states forming the Commonwealth, only three are important as producers of wheat, viz., New South Wales, Victoria, and South Australia. These states produced 52 out of the 56 million bushels which represent the average production of the last decade. The remaining states produced but 4 million bushels—West Australia with 2 million, Tasmania with 1 million, and Queensland with 1 million bushels.

The production in the three more important states forms the subject of the following table:—

TABLE XLIV.

	Area.			Yield.			Produce.		
	Million acres.			Bushels per acre.			Million bushels.		
	N.S.W.	V.	S.A.	N.S.W.	V.	S.A.	N.S.W.	V.	S.A.
1881–90	0·3	1·1	1·8	13	10	6	4	11	11
1891–00	0·8	1·6	1·6	10	8	5	8	13	8
1901–10	1·6	2·0	1·8	11	10	8	17	20	15

It will be noticed that in the first decade the greatest acreage was in South Australia, considerably less land was given to wheat in Victoria, and very little in New South Wales. The yield per acre varied in the reverse order, for at each period New South Wales had the greatest yield and was followed by Victoria, and this state by South Australia. This being so, it is not surprising that in the states with the higher yields wheat cultivation was extended till now Victoria has exceeded South Australia, and New South Wales is not far behind, while in regard to the total production, Victoria leads and South Australia is third.

NEW ZEALAND.

TABLE XLV.

Period.	Area.	Produce.			Net exports.			Consumption.	
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of harvest exported.	Percentage of flour in net exports.	Total (as food).	Per head.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.			Million bushels.	Bushels.
1881–90	0·3	25	8	—*	3	34	0	5	9·5
1891–00	0·3	25	7	—	1	18	0	6	8·7
1901–10	0·2	31	7	—	1	10	0	6	7·1

The decrease in the acreage, production, and export is very exceptional. In the predominance of pastoral work with a relative neglect of grain cultivation, New Zealand resembles, and indeed exceeds, Uruguay. In regard to wheat-growing a parallel even more close than that between New Zealand and Uruguay may be found between New Zealand and Tasmania. Among other points of resemblance the high yield per acre may be noted: in Tasmania it is over 20 bushels per acre, and, therefore, nearly twice that in any other Australian state, and in New Zealand it is over 30 bushels per acre.

Table XLVI. combines the statistics of acreage, yield, and production so that the countries may be readily compared one with another. It gives the totals for each continent, and also those for the British Empire and for the whole world.

Taking the world as a whole there was an increase of about 300 million bushels (about 14 per cent.) from the first to the second period; but from the second to the third period there was an increase of nearly 700 million bushels (about 25 per cent.). This great increase was due mainly to an increased acreage, but to some extent (about 8 per cent.) to an increased average yield per acre, for while in the first two periods this was 12 bushels, in the third period it rose to 13 bushels per acre.

In each period Europe has produced more than half the total crop, North America has come next, and Asia has been third. The other continents have produced a much smaller amount: South America has increased its importance because of Argentina, and Africa and Australia each produce the same small quantity.

The British Empire produced nearly 20 per cent. of the total in the first period; in the second there was an absolute, as well as a relative, decrease in the production so that the proportion fell to below 16 per cent.; in the third period an increase took place and the proportion rose slightly to nearly 17 per cent.

The examination already made of the conditions in the separate countries has led to the conclusion that the acreage may be considerably extended, and a comparison of the yields per acre suggests that in many cases a higher return may be expected. Thus as the United States already has an average yield of 14 bushels per acre there seems no reason why, with improved methods of cultivation and greater care of the soil, at least as high a return may not be obtained in European Russia, where the average is but 10 bushels. If this rise took place it would mean, on the present acreage, an increase in production of 190 million bushels, for European Russia would produce 650 million bushels, an amount equal to that obtained from the United States where the acreage is the same.

TABLE XLVI.—Summary Table of Production.

	Area sown.			Total harvest.			Yield per acre.		
	Million acres.			Million bushels.			Bushels per acre.		
	1881–90	1891–00	1901–10	1881–90	1891–00	1901–10	1881–90	1891–00	1901–10
United Kingdom	2·7	2·0	1·7	76	60	55	28	30	32
France	17·2	17·1	16·2	301	305	319	17	18	20
German Empire	4·7	4·9	4·6	93	123	133	19	25	29
Austria-Hungary	9·5	10·9	11·9	161	186	213	17	17	18
Russia-in-Europe	30·2	36·2	47·4	244	300	461	8	8	10
Scandinavia ...	(0·2)	0·2	0·2	4	5	6	(22)	24	27
Iberian Peninsula	(9·7)	(9·8)	10·0	(107)	(99)	131	(11)	(10)	13
Italian Peninsula	(11·3)	11·3	12·2	118	123	163	(10)	11	13
Balkan Peninsula	(6·0)	(5·8)	(6·0)	(76)	(74)	(77)	(13)	(13)	(13)
Roumania ...	(3·4)	3·7	4·4	(42)	52	73	(12)	14	17
Belgium	0·6	0·5	0·4	18	16	13	30	33	35
Holland	0·2	0·2	0·1	6	5	5	27	28	33
Switzerland ...	(0·1)	(0·1)	(0·1)	3	4	4	(29)	(31)	(33)
Denmark ...	(0·1)	(0·1)	(0·1)	4	4	4	(27)	(30)	(35)
Europe ...	(95·9)	(102·8)	115·3	(1253)	1356	1657	(13)	(13)	(14)
Russia-in-Asia ...	(8·4)	10·6	14·3	(74)	100	155	(9)	9	11
India	26·7	25·2	26·0	259	243	294	10	10	11
Japan	1·0	1·1	1·2	13	19	20	13	17	17
Persia	(2·2)	(1·9)	(1·6)	(22)	(19)	(16)	(10)	(10)	(10)
Turkey in Asia ...	(4·5)	(4·5)	(3·5)	(45)	(45)	(35)	(10)	(10)	(10)
Asia	(42·8)	(43·3)	46·6	(413)	(426)	520	(10)	(10)	11
Dominion of Canada	2·3	3·1	5·9	38	55	110	16	18	19
United States ...	37·1	43·1	47·4	427	559	657	12	13	14
Mexico	(1·2)	(1·2)	(1·0)	(12)	12	10	(10)	(10)	(10)
North America	40·6	47·4	54·3	477	626	777	12	(14)	15
Argentina ...	2·0	5·7	12·0	24	65	130	12	11	11
Chili	(0·9)	(1·0)	1·1	(12)	14	16	(13)	(14)	14
Uruguay	(0·4)	0·6	0·7	(4)	6	7	(10)	10	10
South America	(3·3)	7·3	13·8	(40)	85	153	(12)	12	11
Algeria	(3·1)	3·2	3·3	(21)	24	33	(7)	8	10
Tunis	(0·8)	1·0	1·1	(5)	6	7	(6)	6	6
Egypt	(1·2)	(1·3)	1·3	(12)	(13)	(20)	(10)	(10)	15
Union of South Africa	(0·2)	(0·3)	0·5	(2)	(2)	3	(8)	(8)	6
Africa	(5·3)	(5·8)	6·2	(40)	45	63	(8)	(8)	10
Australia ...	3·2	4·1	5·7	27	30	56	8	7	10
New Zealand ...	0·3	0·3	0·2	8	7	7	25	25	31
Australasia ...	3·5	4·4	5·9	35	37	63	10	8	11
British Empire	35·4	35·0	40·0	410	397	525	12	12	13
World	192	211	242	2258	2575	3233	12	12	13

It lies beyond the scope of the present paper to extend a discussion of possibilities, but it is hoped that the various data here presented may in some degree aid in that "intelligent anticipation of the future," which is the concern of statesmen even more than of the geographers to whom they must turn for their facts.

The writer desires to acknowledge his indebtedness to Mr. G. G. Chisholm, who kindly read the manuscript and made several valuable suggestions which are now incorporated in this paper.

Sir ATHELSTANE BAINES (after the paper): I am afraid that I have not gone sufficiently into the paper to discuss its wider bearings, but the excellent summary and lantern-slides have provided me with one point, at all events, upon which I can offer a few remarks—I mean the supply of wheat from India as a factor in the world's market. It strikes me that the trend of export from that country is more in an upward direction than the author anticipates. His table shows the great extension of wheat cultivation under irrigation, and there is this difference between the situation in India and that in the United States—that the amount required for local consumption in the former is not increasing in anything like the same proportion as it is in the latter. I have to speak diffidently about contemporary Indian details, seeing them darkly through the glass of twenty years' absence from that country; but in my time, when wheat-growing for export was comparatively in its infancy, there were not more than from 4 to 6 millions with whom wheat was the chief cereal food. The cultivators, shrewd enough where their own interests are concerned, grow their millet and other grain for subsistence as the autumn crop, and utilize the greater irrigation and transport facilities now accessible to them for a winter crop grown mainly for profit. I remember it was much the same years ago with cotton and seeds, when Berar found it could live on 45 per cent. of its cultivated area, and cover the rest with fibre, oil-seeds, and the like, destined for export abroad. It seems to me, therefore, that the supply of Indian wheat is likely to increase, both absolutely and in its relative importance, in our own market. It has already stepped in once most effectively, to keep down the price here when it was being violently sent up by abnormal circumstances in other producing regions, and, with greater care in fitting it for market, Indian wheat may have the same effect again.

The question of Canadian wheat is, of course, far more interesting and important, and on this I have no doubt others will speak with fuller knowledge than I possess. I can only add that I have found the paper most interesting and full of information which I hope to lay by for future use.

Mr. B. C. WALLIS: I would like to say, first of all, that I appreciate, from my own experience of the same sort of figures, the amount of work Dr. Unstead has had to do. There is one point in connection with the final table I should like to speak about. If you take Dr. Unstead's figures and percentage them. so that instead of the figures which he gives in absolute measurements you get them in relative measurements, and then if, instead of taking his final yield per acre in bushels, you divide the percentages of the yield by the percentages of the acreage, you get some very interesting facts. In the case of the United Kingdom, the numbers in the third column are 242, 242, 242; in the case of France, 147, 146, 147; Austria-Hungary, 143, 139, 135. I have not worked out the figures for all the countries; but in the case of Canada they are 140, 140, 140. Those are the chief countries where the number is above 100, and

yet where there is little change in the three decades. In the case of Iberia and the United States the number does not change very much, and is about 100. The numbers for Russia, 69, 68, 74; Australia, 70, 63, 72, are low and do not change a great deal; but when you come to Germany, on which some stress has been laid, you get these remarkable results: 167 in the first decade, 208 in the second decade, and 216 in the third decade. This result suggested at once that it would be, perhaps, advisable to investigate Germany a little closer. It became obvious, when these numbers vary in the case of Germany and do not vary anywhere else, except in the Argentine which is negligible, that Germany was different from these other countries; so I looked up the figures for Germany, and I found, from a reference in the Statistical Abstract for Foreign Countries, that from the year 1899 onwards the people who made the estimates differed from the people who made the estimates in preceding years. The estimated total yield for Germany from 1899 to the present time is a very much higher number than anything in any preceding year. The area on which that yield was produced is lower, by a considerable amount in some cases, than during the preceding portion of the period under discussion. If you take nine-year averages instead of Dr. Unstead's, so as to get two nine periods under the old method and a third under the new method, instead of a jump of from 19 bushels per acre in the first decade to 25 and then 29, you get 19 in the first nine years, 22 in the second nine years instead of 25, and 29 in the third nine years. So if you take nine-year periods instead of decades, the evidence accumulates to such an extent as to point out that the progress to which our attention has been drawn is not a real progress. How much is real is a very debatable point, and one would have to investigate the details of the collection of statistics in Germany very closely; but it seems quite clear from the year 1899 to 1910 the statistics have been collected in so different a way as to invalidate a comparison between 1901 to 1910 and the preceding decades. I hope that this point may be investigated by some one who knows more about it than I do, and I suggest that this is a very serious difficulty in connection with the German figures.

With regard to the New Zealand figures, to which Dr. Unstead has not referred in detail, some years ago I had to look at these, and I have come to the conclusion that New Zealand was a country on the margin of cultivation. The figures fluctuate very remarkably, and when you put these fluctuations by the side of a series of figures relating to production elsewhere, you find that a world shortage caused in New Zealand a tremendous outburst of wheat cultivation in the next year; that was followed by a failure to sell the produce, much of which, therefore, rotted on the ground; then there was an immediate decline in acreage, so that New Zealand exhibits a continuous succession of ups and downs, and that succession is reflected by the fact that it makes the consumption in New Zealand something like 9 bushels per head. That is very fictitious, because so much of the wheat has not been used for food at all.

In the case of our own country the margin of cultivation has been mentioned. I have by me some statistics relative to the county of Nottingham. The Board of Agriculture have been good enough to let me have values for small areas within the county of Nottingham. These areas are based upon the geological formation. The best wheat-producing part of the county is the Keuper; the other formations do not yield such good returns of wheat. During the period 1870 to 1901, wheat cultivation declined for the whole county of Nottingham in much the same ratio as wheat cultivation throughout England declined; but in the smaller areas the poor wheat-growing formations show a greater decline than the average for the county, while the Keuper shows a much

smaller decline than the average. Consequently, in reference to the county as a whole, the withdrawal of land which is on the margin of cultivation does not affect the relative statistics; but this withdrawal becomes obvious in regard to the smaller areas, which are about 12 square miles in area.*

Mr. N. F. MACKENZIE: Two points I wished to bring forward with regard to India. The first, as to the possibility of increased export, has already been dealt with, and I agree with the previous speaker. The second point was about the figures themselves. The total area under wheat is practically constant for the whole of the thirty years—about 26 million acres. In these thirty years there has been a great increase in irrigation. In 1881 the total area irrigated from Government works was 11 million acres; in 1891, 14 million; in 1901, 19 million; and in 1911, 22½ million acres. Now, most of that extension of irrigation has been in Upper India and particularly in the Punjab. If the total irrigation from Government works has doubled, and if most of the increase has taken place inside the wheat area, I think it reasonable to suppose that the irrigation of wheat has more than doubled during the thirty years. One would expect to find a reflection of that increase of irrigation in the out-turn per acre, but it does not appear, and the figures require explanation. I believe the explanation is that there is very little unirrigated wheat in India. That does not agree with statistics, but it depends on what one means by unirrigated wheat, which I take to be wheat entirely dependent on rainfall. To take a concrete example from Sind, out of a total cultivated area of 4 million acres some half a million is returned as unirrigated, and much of that is wheat. The rainfall is only 5 inches or less in Sind, and you cannot grow wheat under those conditions, so where does it come from? The unirrigated wheat is grown on a double-cropped area. In the hot weather millets and cotton are grown. They are irrigated from the inundation canals. The land is saturated with water, and retains sufficient moisture for the cold weather wheat to be sown and come to maturity without any further irrigation. That wheat is returned as unirrigated, but it is entirely dependent on the heavy irrigation of the hot-weather crops. I think, therefore, the explanation of the rather remarkable figures Dr. Unstead has given in his statistics of India lies in the fact that there is very little unirrigated wheat grown.

Mr. J. WRIGLEY: It is rather difficult to speak on such important figures at a moment's notice, but I should like to point out the larger yield in Canada than the yield in the United States. I believe it is a fact that the further north you go up to a certain point, not only is the quantity larger, but the quality is better. That is an important question for Canada, because the southern part is now getting settled up, and no doubt the quantity and probably the amount per acre will increase. How far north wheat can be grown becomes important, as Canada goes up into the Arctic regions. If in high latitudes the quality and quantity be found to be good, that fact may prove of great value.

Dr. UNSTEAD: In regard to the probability of increased export from India, I am afraid I did not give sufficient emphasis to the sentence in the paper which referred to "the extension of irrigation which may bring new land into cultivation in the drier areas." I had added this as a qualification to the preceding

* Since the meeting at which Dr. Unstead's paper was read, I have been informed that the German authorities have themselves issued corrected values for wheat production and acreage, and have thereby admitted the fact that the original records for the period before 1898 are not comparable with those for the period since that year.—B. C. W.

sentence suggesting that the acreage under wheat might not be increased to any marked degree, and I am glad to have the opinions of Sir Athelstane Baines and Mr. Mackenzie that irrigation is, as a matter of fact, likely still further to increase the export from India to a considerable extent. Also the point made by Mr. Mackenzie is of considerable importance, when he suggests that wheat land returned as unirrigated is in reality irrigated by water supplied to a preceding crop. Sir Athelstane Baines and Mr. Wallis have both referred to an aspect of the export trade in wheat which is well worth more consideration than I could give in this paper, namely, the extent to which certain countries, although not on the average exporting great amounts, yet occasionally supply a very appreciable quantity when production elsewhere has fallen below the normal. In certain years both India and New Zealand have sent amounts to the United Kingdom far in excess of the average quantities shown in the tables here presented. Mr. Wallis's explanation of the high figures of consumption per head in New Zealand is very welcome, and affords some confirmation of the suggestion made as to the similar figures for Canada. Also his study of the changes in the wheatlands in Nottingham is an interesting confirmation of the view here stated that the decline in acreage in Britain has been a potent factor in eliminating the poorer wheatlands, and therefore in raising the average of the yield per acre. In regard to the altogether extraordinary increase in the yield per acre in Germany as shown in the tables, Mr. Wallis suggests that it may be fictitious and due to the difference in the mode of compilation which occurred in 1899. The point is pertinent, and certainly demands further study. I have, therefore, to thank Mr. Wallis and the other speakers for their helpful suggestions.

Mr. YATES THOMPSON: It only remains for me to ask you to pass a vote of thanks to Dr. Unstead for his paper.

Addendum by Dr. UNSTEAD: In regard to the statistics relating to the German Empire, references have been kindly furnished by Mr. Wallis, and these have made it possible to revise Table VII. The estimates of production for the earlier years were certainly too low, and it appears probable that they should be increased by about 12 per cent. The following table gives the results:—

Period.	Area.	Produce.			Net imports.		Consumption.		
	Sown with wheat.	Per acre.	Total.	Reqd. as seed.	Wheat and flour.	Percentage of milled flour in net imports.	Total (as food).	Per head.	Percentage of supplies imported.
	Million acres.	Bushels.	Million bushels.	Million bushels.	Million bushels.		Million bushels.	Bushels.	
1881–90	4·7	22	104	12	18	0	110	2·3	16
1891–00	4·9	25	125	12	41	0	154	2·9	27
1901–10	4·6	29	133	11	70	0	192	3·1	36

The statements in the text have therefore to be slightly modified: the production seems to have increased 30 per cent., not 50 per cent.; the increase in yield is from 22, not 19, bushels to 29 bushels per acre; the percentage of supplies imported has increased from 16, not 18, to 36 per cent.; and the consumption per head has increased from 2·3, not 2·1, to 3·1 bushels per head. But in no case is the change great enough to affect the general truth of the statements, and the conclusions drawn from the statistics also seem to be unaffected.

THE LIBYAN DESERT FROM NATIVE INFORMATION.*

By W. J. HARDING KING.

THE information upon which the accompanying map is based was collected in Egypt during the winters of 1909, 1910, 1911, and 1912. My principal informant was an Arab guide, a native of Surk, in Kufra, a member of the Senussi sect, who, in addition to having travelled extensively in the Sudan and the desert, had been for about six years some sort of tax collector among the Bedayat for the Sultan of Darfur.

In constructing the map three main routes, all closing up on to places more or less accurately fixed, were first plotted; the remaining information was then fitted into them or plotted from reliably fixed points taken from other maps.

The three main routes were as follows:—

ROUTE I.—FROM TOLAB (IN KUFRA OASIS).

Three days south to Bushara, which lies in a valley among a cluster of rocky hills one day's journey in diameter.

Four days south to Asara; the road follows the dune belt.

Six days south-south-west to Tikeru, the first day being due south following the dunes, and the other five some distance away from them. The Arabs consider Tikeru the northern limit of the Sudan. The water here is good, though salt is got from the neighbourhood.

Half day west to Erwulli, where there is a sweet-water well, though there is a good deal of salt in the neighbourhood.

Three days west to Guru. After the first day's journey the road enters the dunes, and Jebel Kusu, which lies six days west from Erwulli, is sighted.

Three days south-west to Unguri.

One day south-south-west to Ertha, where there is a Senussi Zawia.

One day west to Bidau.

ROUTE II.—FROM TIKERU.

Three days south to Wanjunga Kebir. There is another Wanjunga to the east, one day distant, known as Wanjunga Sogheir; both are inhabited. This district, which is sometimes called Wanjungat, is said to have a language of its own. It is governed by a very old sultan called Mayna. There is a Senussi Zawia here.

Three days south to Bedadi, a Bedayat well where there are a few date and dom palms.

Three days south to Funfun. A Bedayat well. The water is close to the surface of the ground.

One and a half days to Wayta Sogheir, a well.

One short day south to Wayta Kebir; this is a district with many wells and rich vegetation in the dry weather. A swamp in the rains. A very unhealthy part, and in consequence no one lives here except in the winter. To the north the country is all rock, but fertile to the west and south. Wayta Kebir lies four and a half days north of Um Shaloba (Mushaluba), which has recently been fixed by the French.

One day east to Um el Atham, a Bedayat well. There is a "high mountain" between here and Ershai lake.

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* Map, p. 320.

One day south to Baki, a Bedayat well. The road has the mountain on the east at first, and then goes through a pass with rocky hills on both sides of it. Wadi Ershai lies half a day to the west.

One short day to el Guttara, which lies in a valley in which there is a very high rock called "Wuguf," which has water in pools on the top of it.

Two days east to Ain el Baytha, which lies between two very high hills in an open plain containing many "Sunt" trees.

Two days east to Bau, a Bedayat well (pool) on a rock, below which is a fertile valley which always has people in it. This is apparently one of the chief Bedayat centres in winter.

One and a half days south to Kufara, an open valley with plenty of water.

One day east to Mejoures, a wadi.

Three days and two hours to Howar Wadi. The first two hours the road lies in the Wadi Mejoures. The Howar wadi is a long valley, said by the Arabs to be an old watercourse, that runs into the Nile slightly north of Dongola. It is a clay valley with much water in winter, but dry in summer; in places it is as deep and wide as the Nile valley. It is the boundary between the Zaghawa and the Bedayat. Starting from the Nile and going west, the following are the names of the wadis that are said to run into it:—

1. Musbut from the south. This wadi has a place in it called Bohuraz, and probably the wadi is also sometimes called Wadi Bohuraz. The old maps show, evidently from native information, a Wadi Abu Haras, and since Abu and Bu are interchangeable forms, this is apparently Bu Haras or Bohuraz. The name in the old maps is applied both to a big east and west wadi, and also to a small tributary of it from the south. Possibly the common mistake has been made of assuming that the main stream and the tributary are identical.
2. Shegig from the south. A small wadi.
3. Faruwiah from the south.
4. Mejoures from the north.
5. Sfayah from the south.

Two days south-south-east to Faruwiah Wadi. The wadi belongs to the Tuar branch of the Zaghawa. It contains many wells where the natives stay in summer.

Two days south-east to Musbut. This is said to be on the continuation of the Derb El'arbain. (See also above.)

Two hours south to Bohuruz (see above). Belongs to the Tuar branch of the Zaghawa.

Two days south-east to Formah, a Zaghawa well.

Two days east to Kafut. Beyond this point the route has been surveyed.

Route III.—From Dongola.

Five days south-west to Bu Senata.

Four days west-south-west to Medob.

Five days west to Bu Zibad.

Three days west to the Howash valley.

The position for Medob and the Howash valley from this route are much in error when compared with those fixed by actual survey. It is possible that my informant got the name of the Howash valley wrong. His description of it, however, is interesting. He said it contained ruins of burnt brick (? meroitic) and had wall paintings on its sides. Also that there were many statues (apparently

colossi) and pits in the ground containing ashes (? human remains) covered with stone slabs.

The information upon which the remainder of the map is constructed is embodied in the following list of places, which also gives any other miscellaneous data collected. My informants were all Arabs, so the names are those in use among the Beduin, and may differ from those used by the Tibbus, Bedayat, and other Sudanese. Many of the names apply both to wadis and to the principal wells or settlements in them.

The *Bedayat*, sing. *Ebday*.—The Bedayat country runs for seven days north from the Zaghawa, and from Wayta Kebir in the west to Merga in the east. It is mainly rock which weathers into "rusuf" (*i.e.* sand-grooved stone), with many low rocky hills (*garas*), and contains many fertile valleys below. As "rusuf" is a form of erosion that does not appear on a sandstone formation, but only in hard rock, it is possible that the limestone reappears in the south of the Libyan desert. In the wet season the rainfall forms pools and lies on the top of the rock, but sinks into the porous soil of the valleys below, unless they happen to have a clay bed. In the dry season most of the pools dry up, and water can only be found in the clay valleys. There are reported to be many rock inscriptions, stone-built ruins ("ders"), and "Roman" (*i.e.* artesian) wells like those in the western oases of Egypt.

The Bedayat have the following tribes:—

I. The Hurri, living round the Hirri lake.

II. The Kowora tribe (a very large one), under a sheikh called Kabir.

III. A tribe under a sheikh called Fatanu, having the watering-places of Bau, Baskari, and Ershai.

IV. A tribe under sheikh Jahr en Nebi Husain, position unknown.

Birket el Thiour.—A lake which dries up in summer. It is one day across each way. It lies three days north-west from Mushaluba, and three days south-east from Win.

Bir Bu Buzeerig.—A well near Bir Zirhen, two hours distant (? direction); it is "three hours to the dunes."

Bir el Ghard.—A well giving very little water, below a sand-dune, two days west from Erbayana.

Bir Jedayid.—A well one day north-east from Kufra. All the firewood used in Kufra comes from near here.

Darfur.—There is said to be a small white lion and a very big hyena called a "murhayeen" in Darfur.

Demi (also called *Ed Demi*).—A Bedayat well three days east-north-east from Wanjunga (taken to be Wanjunga Sogheir), and three days south-east from Tikeru. There is no water on the road to Tikeru, but sand and scrub. There is red (rock) salt at Demi.

Dendura.—This is Rholf's alternative name for Zerzura oasis (*q.v.*) It is said to lie seven days due west from Bu Mungar. A very large "sif," *i.e.* longitudinal dune, which is almost impassable, is said to lie just to the east of it.

It may be under the lea of one of the three big longitudinal dunes mentioned under the heading of "Dunes," or of a shorter "sif" that has not come down to the direct road between Dakhla and Kufra.

Dour.—Lies three days south-east from a place, name unknown (? Tikeru), that is twelve days south of Kufra. It lies to the north of Wadai. There is a Senussi Zawai here, and it is an important market.

Dunes.—The dunes run parallel to the Tolab-Tikeru road, to the east of it, the whole road being sand-free. All the dunes of the Libyan desert are said to run

from north to south in long lines. In the neighbourhood of Dakhla they were found to run 352° mag., and since they are parallel to the Tolab-Tikeru road, they appear in reality to converge slightly towards the north in such a way that if the lines of the dunes were continued they would eventually meet in about 41° N. lat. and 25° E. long. There is said to be a belt close to the west of Kebabo, in Kufra, about one day wide from east to west. Taiserbo, Buscima, and Erbayana all lie west of this belt. These dunes go to the Sudan, and die out in the vegetation of Wanjungat. Dunes extend from Siwa to Bir Battifal, and die out five days to the south of Siwa, and three hours south from Bir Zirhen. Half the distance from Dakhla to Kufra is over sand, and on the last day there are three (I have also heard, five) enormous "sifs," *i.e.* longitudinal belts of an A section, that are very difficult to cross. Practically the whole of these dunes are stopped by the plateau shown in the map of the *Geographical Journal* for February, 1912. A dune-belt runs down by Owana, and dies out about two days further to the south. A belt also runs past the hill by the "Egyptian oasis," and dies out near Bir Natrun; this belt starts in the Dakhla group. The dunes begin about two hours west of Erbayana, and go for three days—I have heard four—to the west. These dunes are easy to cross. The dunes begin about two hours west of Erwull, and run for about three days further west. This, though approximately the same width as the belt further north, is, perhaps, sand that is banked up by the Tibesti hills, for the belt to the west of Erbayana is said to die out before reaching the latitude of Bushara.

Duss.—A Zaghawa place where there are a few houses and a market on Monday, "if they have anything to sell." It lies two days north of Musbut, two days north from Furuwiah, two days north of Bohuruz.

"*Egyptian Oasis.*"—An Ebday—a friend of one of my guides—told him he had gone with two "hagins," *i.e.* riding-camels, for five days due north from Merga, "following the dunes," and had then climbed a very high black hill in the sand, from which he had seen in the distance a very large oasis, containing a number of olive trees and much "terfa." He was too far off to see if it was inhabited, and was afraid to go in because he said it was an "Egyptian oasis," and he would be killed. Another Arab told me that a cousin of his was riding along the top of a scarp about eight days from Dakhla, when he saw below him a very large oasis, containing a number of olive trees, palms, and wells. It contained one very big ruined town which was uninhabited, and a few "ezbehs," *i.e.* hamlets, in which a few people seemed to be living. It is probably from this oasis that the migrant birds mentioned in the *Geographical Journal* for February, 1912, got the olives that were found in their crops.

Endon.—An east-and-west wadi, which is one of the Bedayat watering-places, three days south from Hurri lake, on the road to Ershai lake. Also described as a well.

Erbayana lies in the Wadi el Fardi.

Erbayana, Oasis west of.—Six days west of Erbayana there is an uninhabited oasis—name unknown—which contains many palms. The people from Kufra go there to get dates. The road from Erbayana for the first four days is over easy dunes and without population. The last two days there are many high rocky hills and wadis (apparently part of the Tibesti range). There is sometimes water in the wadis; it apparently lies in the wadi Ko'ur.

Ershai.—A lake surrounded by mountains; also a wadi which runs into it. The lake contains crocodiles, which seize camels when they come down to drink. The lake is about 3 miles across, of sweet water; it lies seven days south from Hurri lake, the road lying all over stone desert, dry in summer, but with plenty

of water in the rains. The lake is one long day north-east of el Guttara. There is a high mountain between Um el Atham and the lake. Half a day west from el Guttara lies the Ershai Wadi, where there is cultivation and always a number of Bedayat. It runs north and south. Baki lies half a day east from the Wadi, which is two days west of Ain el Baytha and four days west of Bau. After entering the Ershai Wadi from el Guttara the lake lies three days away to the north. The lake and wadi belong to the tribe under Fatanu.

Fardi, Wadi el.—Another name for the wadi Tibbu or Bahr el Ghazal. A wadi —said to be an old river course—running through Guru, Erbayana, Buseima, Taiserbo. It crosses the Jalo-Taiserbo road four days south of Jalo, and then is said to run through Jarabub, Siwa and Bahrein to the Nile. A large number of branch wadis are said to discharge into it from the Tibesti range. These wadis support a large population of Tibbus, but as these are among the chief followers of the Senussya, no definite information could be got of this district. Several wadis are shown, however, on other maps as starting in Tibesti and running in this direction.

There are a number of native reports of dried-up river-beds in various parts of this desert, but as some of them are known to be without foundation, information of this kind must be regarded with suspicion. The Wadi Howar (*q.v.*) is perhaps unreliable, but the Wadi el Fardi sounds more authentic, for wadis have already been reported to exist in all the points mentioned by my informant in its course. In the southern portions of the Tibesti range there must be a considerable rainfall; the ultimate destination of the water which falls on the northern and eastern sides is still unknown. It is possible, though hardly likely, that this water may break back through the range and discharge to the south. If not, it must flow somewhere between north and east. A plentiful supply of water is known to exist in the Kufra group of oases—more than the extremely scanty rainfall of the desert could possibly supply. In the western Sahara the large oasis groups are fed by wadis of this description; the oases in the Twat depression by the Wad Saura bringing down the water from the Atlas mountains, and the Wad Rirh group by the Wad Ighargha from the central Sahara. It seems quite possible that the Wadi el Fardi and the Kufra group of oases are their counterparts in the eastern desert. Possibly, too, the artesian water which irrigates the oases of Dakhla, Farafra, and Kharga comes from the same district.

Jebel Hareega forms the watershed between Wadi Howar and Wadi Howash. This district is ruled by a sultan called Abderrahman.

Hurri, the name of a Bedayat district three days east of Wanjunga, the road from which lies over sand and rock. It contains a lake of good water more than a gun-shot across from north to south and an hour's journey from east to west; there are settlements at the east and west ends of the lake, where there are a few trees, palms, and some cultivation. The two settlements quarrel. Kowora—"Kabir's town"—lies seven days south-south-west from Hurri, with scrub and "water from the stone" in winter on the road. Ershai lake lies seven days south from Hurri. This road is all over stone desert with a great deal of water after the rains, but dry at other times. Three days from Hurri on this road is Wadi Endon, an east-and-west wadi. One day further is a north-and-south wadi called Messu, which lies slightly east of the direct road. One day before reaching Ershai lake is the wadi Lifu running east and west. There is little water in Lifu.

Iddaila.—A road is said to run from here to Kufra; three days along this road there is said to be a big oasis. A road is said to also run west from Iddaila,

hidden for some distance under the dunes. This is said to go to a hattia, two days due west from Iddaila.

Jebel Namus.—Lies two days south-east from Terhuni. There is said to be grass and may be water here. My informant had not been there. Owana lies to the south-east. Jebel Namus seems to be J. en Nari under another name; the old road said to run from J. en Nari towards Egypt perhaps goes through Owana, which would be the "uninhabited oasis" of the old maps. An old road running from Dakhla towards Owana has been found (see *Geographical Journal*, February, 1912).

Jebel Kusu.—The Tibbu name for a mountain six days west from Erwulli. The Arab name is J. Yusu. It is said to be the biggest mountain in Tibesti. It is three days round and covered to the top with forests; two wadis meet to the south of it and form the wadi Tibbu, or Bahr el Ghazal.

Kittibiddi, one day due west from Unguri, in the wadi Tibbu.

Kowora.—An important Bedayat district under a sheikh called Kabir. After one day east from Kowora the desert is all "serir" (*i.e.* sand and pebbles). West of the "serir" it is all rock.

Merga.—The "Hattia of the Bedayat;" contains a small fresh-water lake fed by a spring (? artesian well), surrounded by palms with much scrub—"argoul" and "terfa"—beyond. It is not regularly inhabited, but the Bedayat come up there in the season to take the dates. It is about 10 miles across each way. It lies three to three and a half days south-west from Lagia, and two and a half days north-west from Bir Natrun. (This is probably the place that Miana calls Ptolemy's lake of the mud tortoises.) Two and a half days south-west from Merga there is a pass through a scarp leading to the valley of the Bedayat (*q.v.*).

Nether.—A water-hole on the top of a high rock in the Derb el Arbain, four days south-south-west of Bir Natrun.

No'on.—A small lake, with some cultivation, at the foot of J. No'on, one day west of J. Kutum; a road leads south from the lake, and another road north-east.

Owana.—A place halfway along a road from Merga to Kufra. It consists of a well, the landmark for which is two dom palms. After rain there is much green grass near here, on which wild asses and "bekker el wahash" (probably Barbary sheep) feed. North of the well is a cliff with a pass that takes two hours easy travelling to traverse, and on the top is a small high-level oasis, the landmark for which is two rocky hills that look like one from the north. The scarp runs north-north-west and south-east from the well. Owana is said to lie south-east from J. Namus. The hill "D" (see map, *Geographical Journal*, February, 1912) is reported to be visible from near here. There is no vegetation round the well itself. Possibly the scarp here joins up to J. Namus, and the scarp north of the "Egyptian oasis."

Owanat (plur. of *Owana*).—A name sometimes used for the whole district described under the heading "Owana."

Tehuni.—A place on the road between Bushara and Asara, where there is dried grass, two days north-west of J. Namus. To the east there is high ground that slightly diverts the dunes; it is called Jebel Terhuni.

Terkaz or *Terkasi.*—A hattia "like Kairowin," two or three days north-north-east of Demi. It is the last Bedayat well to the north, and apparently little frequented.

Valley of the Bedayat.—Two and a half days south-west from Merga. There is said to be a pass leading up on to a plateau which runs from north to south. Half a day further west over the plateau there is another pass leading down into a large depression, which is bounded by this scarp on the east, but open towards

the west, "like Kharga oasis." The valley stretches for two days from east to west, and about six days from north to south, the northern extremity being about due west from Legia. There are many settlements here where the Bedayat live in "tukls," *i.e.* huts of straw or brushwood. There are many dom palms, wells (? artesian), flowing into pools, and a great deal of scrub.

Win, four days west of Wayta Kebir, and three days north-west of Birket el Thiur in the Wadi Tibbu or Bahr el Ghazal.

Zerzurah.—It is doubtful whether any place of this name exists. "Zerzur" is Arabic for a small bird, so "Zerzura" would have some such meaning as "the place of small birds," and appears somewhat fantastic. Zerzura seems to be a generic name applied to any undiscovered or traditional oasis. In addition to Dendura—Rholf's Zerzura—I have heard it applied to the "Egyptian oasis," and also to some reported ruins west of Mut.

REVIEWS.

EUROPE.

Partsch's Silesia.

'Schlesien, eine Landeskunde für das deutsche Volk auf wissenschaftliche Grundlage,' bearbeitet von Dr. Joseph Partsch. 2 vols. Breslau: F. Hirt, 1896–1911. *Maps and Illustrations. Price M.*34.

The publication of the third and last volume of the second part of Dr. Partsch's 'Schlesien' marks the completion of an important monograph which, whatever its defects, now makes Silesia one of the better-known provinces of the German Empire. The first volume of this great work appeared in 1896, and was reviewed in the *Geographical Journal*, vol. 7, 1896, p. 417. The three volumes of the second part were published in 1903, 1907, and 1911 respectively. The general plan of the monograph, as given in 1896, has been consistently followed by the author, who devotes the successive volumes of the second part to a detailed account of Lower, Middle and Upper Silesia. These sections of the province are further subdivided into natural regions for convenience of description, and the settlement and development of each from the point of view of natural and social conditions are discussed in a manner which exhibits the author's minute researches into the history of his country.

In his book on Central Europe published in English in 1905, Dr. Partsch enumerated the principal results of his geographical study of Silesia, and his various points may now be found elaborated in his Schlesien, Part II. In the first volume the author compares the early condition of Upper Silesia with that of Ireland, and describes the changes which the discovery of coal, iron, lead, and zinc, and the rise of industry have effected within the region. He gives interesting details of the great wealth of the Upper Silesian coalfield, which has contributed so largely to the development of the ore-mining and smelting industries in the adjoining territory and to the rapid growth in recent times of Königshutte, Benthen, and a host of smaller towns. The main interests of the second volume, on Middle Silesia, lie in the author's description of the mountain industries of the west, where a small coalfield lies at the foot of the Eulengebirge; in his account of the sugar industry of the central plains; and in his story of Breslau, the capital of Silesia, the great market town of the middle ages. The third volume, on Lower Silesia, contains the author's more

recent researches, and is therefore in many respects the most interesting. An important section is devoted to the *régime* of the rivers of the Riesengebirge and the causes and results of the summer floods. Equally valuable is the author's fine description of the Niederschlesisch Lausitzer Heide, in the course of which he discusses a striking instance of the geographical importance of forest belts. Here also (p. 586) he introduces a new method of exhibiting graphically the relief-energy of any region and the device which he uses is a valuable addition to the methods of practical geography.

The monograph exhibits on every page the author's remarkable grasp of facts and events. His method of treatment is consistently historical, with the natural result that enhanced interest is given to the discussion of the larger questions, while minor matters are somewhat overburdened with detail. His conscientious description of the smaller towns and villages tends to become tedious, and much of his material might have been given in gazetteer form. The monograph is apparently unaccompanied by orographical and other maps of the province, while the various volumes are remarkably poorly equipped with distribution maps and those other devices of modern geography which prove of such advantage to the student. Little attempt is made to state the industrial and commercial position of the country in statistical form, and the figures given in the earlier volumes are not even brought up to date in the last. To Dr. Partsch geography is apparently mainly historical and descriptive, and from his own point of view he has achieved a remarkable success. He has provided in these closely printed volumes a mass of exact information which will prove invaluable in future to all geographers, however much their methods and their outlook may differ from his own.

J. D. F.

AFRICA.

The South-Eastern Desert of Egypt.

'The Geography and Geology of South-Eastern Egypt.' By John Ball, PH.D., D.SC. Cairo: Government Press. 1912. *Price* 40 *P.T.*

Geography has gained largely by this survey of the south-eastern desert of Egypt, which was necessitated by the demands for mining and prospecting concessions. It was carried out during the winter seasons of 1905–08, and the results are given in the 'Report on the Geography and Geology of South-Eastern Egypt' which has just been issued. The work of earlier travellers is summarized, but their results are somewhat meagre, since they were gained by rapid traverses only; now for the first time we have an accurate survey based on a careful triangulation extending from lat. 22° to lat. 25° N., and from the Nile valley to the Red sea, covering an area of about 22,000 square miles. The present volume contains an orographical map of this region on the scale of 1: 750,000, and a geological map on the same scale of all the region east of long. 34° E., while several special maps on larger scales are also provided. All this is based on an extensive triangulation in which sixty-nine points were occupied, and more than four hundred others were intersected. Besides this, many local pieces of triangulation connected to short local bases were utilized to control the topographical survey.

The chapter dealing with the survey methods which were employed is particularly interesting, since the local conditions led to several modifications of ordinary field methods. The survey of the coast-line was mainly effected from the hill stations by a free use of depression angles, as was described in a Departmental Paper of the Egyptian Survey which was published a short time ago;

the detailed topography was mapped by tacheometric methods, largely controlled by triangulated points, and much useful work was done by using a boldly graduated staff in conjunction with very long tacheometric sights. Equal altitudes of three stars were employed as the most convenient means for determining latitudes, but the accepted positions are due to the triangulation which was carried from the Nile valley chain to the Red sea with satisfactory precision. The west coast of the Red sea is thus fixed by a more reliable method than chronometric longitudes, and its cartographical position is somewhat altered in consequence. This free employment of theodolite measurements has provided many determinations of altitude, not only of peaks and triangulation stations, but also of many points on spurs, foothills, and on the valley floors, so that the orographical map is exceptionally well controlled.

So much of the country has not hitherto been traversed or mapped, that a large part of the report is taken up by descriptions of all the different valleys, hills, mountains, and water-supplies which were visited, and which it is necessary to record in an accessible form; but this has doubtless hindered Dr. Ball from dealing fully with the land-forms which erosive agencies have produced, and the various stages of erosion which are represented in this region. A discussion of these will doubtless appear in due course, for he must have an exceptionally valuable collection of data to work upon, and his photographs show most interesting examples. The three great drainage systems which flow towards the Nile, having average gradients of less than 1 in 500, contrast strongly with the numerous small systems which drain steeply towards the Red sea; but among these latter, one at least, the Wadi Hodein, drains a wide area, and its head lies far inland.

The last part of the report is more strictly geological, and deals with the various types of rock which occur within the region, and with the general structure of the region. The whole report is of great value and interest, and furnishes a wealth of information on a part of Northern Africa which was previously but little known.

H. G. L.

The Duke of Mecklenburg's Second African Expedition.

'Vom Kongo zum Niger und Nil: Berichte der deutschen Zentralafrica Expedition, 1910–1911.' Von Adolf Friedrich Herzog zu Mecklenburg. 2 vols. Leipzig: F. A. Brockhaus. 1912. *Maps and Illustrations. Price* 20*M.*

The Duke of Mecklenburg's expedition to Central Africa of 1910 and 1911 consisted of eight Europeans besides himself—three military men, three scientists, an artist, and a valet. The expedition entered Africa by way of the Congo, crossed to the Shari and descended that river, then divided into four separate subdivisions. Two of them, returning to the headwaters of the Shari, went to the Ubangi, and thence eastward toward the Nile. The attempted traverse of Dar Kuti had become impossible on account of the unsettled state of the country.

From Yakoma, on the Ubangi, the parties took different roads. One traversed the Azande country by way of Rafai, Semio, and Tambura, and passing through the Gazelle River Province, reached the Nile and Khartum. The second, following the Welle river through the Mangbettu country, took the motor road through the Lado enclave to the White Nile. The third subdivision had branched off from the main party at Kunda on the Congo, ascended the Sanga river through the newly acquired German territory, and by a circuitous route through southern Kamerun, ended at Kribi on the Guinea Coast.

The fourth and main expedition, led by the Duke himself, spent some time in Bagirmi on the Logone and lower Shari, paid a short visit to Lake Chad, and then, after travelling through German Adamawa, entered Northern Nigeria, and returned to the coast by way of the Benue and the Niger.

Geographically little if any new ground was covered by these four expeditions; but the anthropological harvest brought home was very considerable, and the botanical and zoological results were even greater. Dr. Schultze and Dr. Schubotz collected no less than 860 mammals, 2900 birds, about 400 lower vertebrates, and approximately 18,000 invertebrates; while Dr. Mildbraed brought home 3708 botanical specimens, and Lieut. von Wiese, 1700 ethnological specimens, 600 photographs, and 40 phonograms. The Duke himself secured linguistic, historical, and ethnological information.

The northern demarcation of the (Hylæa) forest zone of Central Africa, and the study of the relation of the gallery forests to the park lands of the Central African ironstone plateau, which was made by the expedition from the zoogeographical standpoint, throw much light on the pastoral possibilities and the trade possibilities of the regions concerned.

The expedition had an artist at its disposal in the person of Mr. Ernst Heims. The illustrations, therefore, in the two volumes 'Vom Kongo zum Niger und Nil,' are many of them exceedingly beautiful. This record of the expedition (708 pages) is a compilation due to the collaboration of seven writers.

A map setting forth the tribal divisions in the French Shari Chad Protectorate shows eleven tribes and three sultanates; and though the delimitations of the tribes may not be absolutely correct, even the attempt at such delimitation marks a great step forward in our anthropogeographical knowledge of these regions. Four maps of the Lake Chad district, the Tuburi swamps, Southern Kamerun, and Fernando Pô, give systematized and improved information, while the general map enables the reader to easily grasp the outstanding features of the main and sub-expeditions.

H. K. W. Kumm.

South African Geology.

'South African Geology.' By E. H. L. Schwarz. 1912. Pp. 200. 54 *Figs.*

'South African Geology' is a general text-book on geology written for South African students. The author found that the difficulties of his students in Cape Colony were increased by the different nomenclature in use there in consequence of its different geographical conditions. The author in his preface confesses to his difficulty in conscientiously presenting orthodox geology, and readers of his interesting 'Causal Geology' will understand his position. He has found it necessary, in order to satisfy the external examiners, to abstain as far as possible from the statement of his many heterodox views. The book has profited by this influence, for as a general rule it is inadvisable to trouble elementary students with speculations which are rejected by the majority of contemporary opinion. Most of the work consists of a brief statement of geological principles and processes illustrated by South African examples. The most interesting section of the work to European readers is that (pp. 132–198) on the stratigraphy of South Africa. The chapters on this subject are very concise and give a most useful summary of the historical geology of South Africa as far north as Rhodesia. The book is illustrated by many excellent sections. A few of the palæontological statements, such as the presence of *Nautilus* in the Cambrian (p. 127), might be revised in a subsequent edition. The book unfortunately has no index.

'The Arabs in Tripoli.' By Alan Ostler. (London: John Murray. 1912. Pp. vii., 314. *Illustrations.* 10*s.* 6*d. net.*) Though Mr. Ostler does not appear to have acted as war correspondent attached to any journal, he managed by the exercise of considerable diplomacy to obtain special facilities from the Turkish commander. The author does not attempt anything like a description of the campaign, and for this forbearance the reader should be grateful, as we get instead some vivid sketches of the actual camp-life from one who started with the advantage of a working knowledge of the language, and an insight into the Arab character gained from long travel experience in North Africa generally. Mr. Ostler has a keen appreciation of the varied physiognomy of the desert, and sums up concisely and accurately the character of Sahara caravan-routes—the deviousness and apparent aimlessness of tracks fashioned by the appetites of camels and other beasts of burden browsing as they go, and traversed by a race whose travel is never hurried. There is an ethnological chapter in which the author indulges in speculations as to the origin of the Berber races, maintaining that the Berbers are descended from the pre-Aryan Europeans. In this he is, of course, reflecting to some extent the opinion of ethnologists like Sergi, whose "Mediterranean race" includes both the Berbers and old Europeans, though they hardly claim that the one are "descended from" the other.

AMERICA.

Seventeenth Century Exploration from Virginia.

'The First Explorations of the Trans-Allegheny Region by the Virginians, 1650-1674.' By Clarence Walworth Alvord and Lee Bidgood. Cleveland: The Arthur H. Clark Company. 1912. *Price* $3.

This work supplies an important chapter, hitherto practically unwritten, in the history of Western exploration within the limits of the present United States. A contrast is constantly drawn by historians between the bold and rapid advance of the French pioneers in Canada in the seventeenth century, and the more gradual and plodding work of the British settlers in the more southern part of the continent. This idea is shown by the authors of the present work to be only partially correct. It has owed its currency to the lack of accurate information on the doings of the early Virginian adventurers—a lack from which even such careful writers as Parkman and Winsor suffered when touching upon the subject, and which led them to treat as unconfirmed rumours the stories of journeys by Englishmen over the Allegheny divide into the basin of the Ohio, although, as is now shown, there is clear documentary evidence for the fact of such journeys, as well as some amount of detailed information about them. In the volume under review the editors bring together for the first time all the most important documents bearing on the question, some consisting of scarce published works, others of letters and reports never before printed. They also supply an instructive introductory sketch of the conditions obtaining in the southern colonies at the time, and the general course of western enterprise within the period defined in the title.

Among the most energetic of the colonists who sought to open up routes for trade across the western mountains was Abraham Wood, of whose life and character a sketch is given in the introduction. Not only did he make at least one journey of exploration himself, but through his agents he played a foremost part in the whole of the work accomplished. Mistakes have been made by historians as to both the dates and extent of these journeys, and this has been, no doubt, a reason for the discredit thrown upon them. The first venture, that of

Bland and Wood in 1650, led no great distance afield, and was not at once followed up. It was about 1668 that an impetus towards western adventure was received in Virginia from the same influential circles in England to whom the founding of the Hudson Bay Company was due, the threefold inducements being a desire to reach the western ocean and gain a share in Asiatic commerce; the hope of discovering mines of precious metals; and the fur trade. The journeys that resulted, and which are dealt with in the documents printed in full, were those of John Lederer, 1670; of Batts and Fallam, 1671; of Needham and Arthur, 1673; and of Arthur alone, 1673–74. A continuous intercourse with the western interior was thenceforth maintained, and the results of the south-westward explorations of Needham (one of the most influential class of frontiersmen) were particularly important as opening the Cherokee trade to the Virginians, and paving the way for the ultimate expansion of English influence in the direction of the Mississippi. E. H.

South American Tribes.

'Aborigines of South America.' By the late Colonel G. Earl Church. Edited by Sir Clements R. Markham, K.C.B. London: Chapman & Hall. 1912. 10s. 6*d. net.*

Sir Clements Markham has added to his already great services to South American history by editing and writing a preface for the work of his late friend, Colonel Church. Sir Clements has himself recently attempted the difficult problem of classifying the Amazonian tribes, and is better able than any one else to estimate the author's success in this most intricate part of his task. The end which Colonel Church had in view was to locate as far as possible the different tribes at the time of the conquest, and with this object he made an extensive study of Portuguese and Spanish writings, both by missionary fathers and others in the early days of European occupation, and by more recent travellers and residents in the continent. He had himself travelled far and wide in South America—in the Argentine, in Bolivia, where he was commissioned by the Government to open the 3000 miles of Amazon tributaries to navigation, in Ecuador, Brazil, and Peru, though it is little enough that we are told of these experiences. There is much matter of great value in the book, and we deplore that the author's death prevented the completion of his work.

The Introduction contains a brief account of the inland seas—the Pampean sea, the Mojos lake, and the Amazon sea, which the author believed to have existed within the period of human habitation, and to have covered over a million square miles in the aggregate. Whether or not the Andes, since they were inhabited, have increased in height, these inland seas would account for their former fertility at altitudes where the soil is now utterly sterile.

The first chapter, "Caraios or Caraïbes," will arouse much criticism, for it reopens the question as to whether or not Tupis and Caribs are of distinct origin. The author held that "the so-called Brazilian Tupis were in reality Caraios or Caraïbes and their offshoots" (p. 25), that their cradle was about the middle or lower Paraná, and that one of their chief lines of migration northwards was down the Rio Madeira. Now, these opinions are somewhat subversive of the results yielded by recent ethnological fieldwork. Physically, it is true, there is little divergence between Caribs and Tupis, and both are aggressive warrior peoples chiefly depending on fishing for a livelihood; indeed, Von Martius regarded them as descendants of a common race. Von den Steinen, after a careful study of the Bakaïri (primitive Caribs) and other tribes of the Xingu, is convinced on linguistic grounds "that the favourite hypothesis of several distinguished authorities that Tupis and Caribs are related has been finally confuted by the two Xingu expeditions; the roots of the two languages show

no correspondence." But our author attaches little weight to linguistics as a criterion of race. The treatment of this question of migration reveals the chief defect in an otherwise admirable book, namely, that very small heed is paid to ethnological research. Ehrenreich's work is not referred to at all; Von den Steinen is just mentioned in a footnote. Future investigations may prove the assumption to be correct that the Rio Madeira was a great highway of racial movement; the author certainly succeeds in showing that it is better suited than other Amazon tributaries for the advance of conquering armies, if the Caribs did proceed in large bodies.

The value and merit of the book lie in the careful delimitation of tribes long since driven inland or annihilated by the Portuguese along the Brazilian coast or by the inroads of the Spaniards across the cordilleras, in the admirable descriptions of the exploration of the Amazon tributaries of the far west from Inca times down to Dr. Heath's expedition in 1880, and in the history of the persistent endeavours of Jesuit and Franciscan missionaries to obtain a footing among hostile tribes. The pages of South America's history are stained with much bloodshed, and atrocities on the part of her conquerors often drew down awful vengeance from cannibal aborigines, of which several instances are given.

There are a few minor inaccuracies, which are bound to occur in a posthumous work, and certain points require confirmation by a competent man of science, such, for instance, as the existence of blue-eyed Tapuyas (p. 69) and red-haired Mataco children; it is unusual, surely, for Patagonians to have black skins inclining to red, and their average stature is considerably over 5½ feet—it ranges, in fact, up to 6 feet. There is a map embracing most of the area dealt with, and a brief biographical notice of the author.

A. C. Haddon.

'The Flowing Road.' By Caspar Whitney. (London: Heinemann. 1912. Pp. 319. *Maps and Illustrations.* 12*s.* 6*d.*) This author, an American who writes with a strongly individual style, travelled in South America on the Negro, the Casiquiare, and the Orinoco. Though not equipped for surveying work, he has several interesting comments on topographical points, as he found them to differ from the manner in which they have been described by those who have preceded him. For example, he shows a sketch of the cataracts and great bend of the Negro, differing markedly from the usual representation on maps. His remarks are also of interest on the hydrographical conditions of the Casiquiare, and after reaching the upper Orinoco he passed above the "barrier" and observed some of the practically unknown "savage" Indians, whose bloody reputation has long kept their territory inviolate.

'The Conquest of New Granada.' By Sir Clements R. Markham. (London: Smith, Elder. 1912. Pp. xvii., 232. *Map.*) This volume deals with the encounters between the Spaniards on their advent into South America and the Chibcha nation, which they destroyed. Four chapters are devoted to a study of this people, their life, religion, language, and government. The story of the coming of the Spaniards is then taken up, from the time of the early struggles of Bastidas, Ojeda, and Nicuesa, the good work of Vasco Nuñez de Balboa and his discovery of the Pacific ocean, down to the expeditions and death of Quesada. A suitable map of the upper Magdalena valley and the Bogotá region is provided. References to original sources are frequently furnished, and with appendices give this brief volume a high scholarly value, in spite of the modest disclaimer of full qualifications for the task which are made by the author, who hopes that the study will be more fully taken up, as it has yet to be, by an English writer.

'Latin America: its Rise and Progress.' By F. Garcia Calderon. (London: Fisher Unwin. 1913. Pp. 456. *Map and Illustrations.* 10*s.* 6*d.*) This volume of the South American series is in the main a political and economic summary, which adds to the volumes on each country a broad independent view of the conditions and relations of all. It is hardly at all concerned with geographical conditions, and does not seek to apply their consideration to that of human activities. But on one geographical question it is possible to join issues with the writer. The effects of the opening of the Panama canal are inevitably discussed; it is surely overstating the case to assume that this event will "displace the political axis of the world," or to regard the Pacific under *existing* political conditions as a *mare clausum* whose rule is shared by the United States and Japan. The work next to be noticed would appear to put the matter with calmer judgment.

'A History of South America.' By C. E. Akers. (London: Murray. 1912. (2nd edit.) Pp. xxviii., 716. *Maps and Illustrations.* 21*s.*) It is a matter of no surprise that, in view of the wide interest in South American affairs, a second edition of this important work should have been called for. A chapter has been aded at the end, discussing political and economic developments to date since 1904, when the first edition appeared. In reference to what was written about the volume previously noticed, we read here, by contrast, that the economic effect of the Panama canal will only make itself visible gradually and slowly, and the same will no doubt be true of any political effect which may result.

AUSTRALASIA AND PACIFIC ISLANDS.

Papua.

'Papua or British New Guinea.' By J. H. P. Murray, Lt.-Governor and Chief Judicial Officer, Papua, with an introduction by Sir William MacGregor, G.C.M.G., C.B., D.SC., LL.D. *With* 38 *illustrations* (*a map of Papua*). London: T. Fisher Unwin. 1912. *Price* 15*s. net.*

After reference to books on New Guinea of quite other kind, such as "Miss Grimshaw's fascinating work 'The New New Guinea' [which] treats, as its name implies, of the recent development of the territory; Dr. Seligmann's learned 'Melanesians of New Guinea' [which] is occupied with the ethnology of a few tribes; and the Rev. M. Chignell's admirable 'Outpost in Papua' [which] is almost entirely confined to a description of life in a single village," Mr. Murray justly claims that having given some of the best years of his life to the administration of the territory, he may add something useful on Papua [*i.e. British* New Guinea] as a whole.

He has effected his purpose in fifteen chapters, in which he has brought together, from many sources which his official position put at his disposal, much information as to the geography, history, native population, administration of justice, exploration, and development of Papua; and to this Sir William MacGregor, to whom much of the early development of the territory is due, has added a useful preface.

The map and index are serviceable, and the illustrations are better than usual. E. IM T.

'By Field and Flood.' By Alfred Searcy. (London: Bell. 1912. Pp. 327. *Map and Illustrations.*) This book has the sub-title of "Adventures Ashore and Afloat in Northern Australia," and certainly needed it, for the title itself can hardly be commended either for lucidity or for appropriateness to a book which

deals with a mere personal narrative of one who has worked his own way in Northern Australia, and has had many exciting adventures with both men and beasts, and with the forces which nature exercises against those whose lot is cast in tropical lands.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Weather Forecasting.

'Nouvelle Méthode de Prévision du Temps.' Par Gabriel Guilbert, avec une Préface par Bernard Brunhes. Paris: Gauthier-Villars. 1909. Pp. xxxviii., 331. *Charts and Plates.*

The rules laid down and discussed in this work for forecasting the weather may be said to represent the most advanced stage of the method of synoptic charts yet attained, and although it may be some time before they are adopted in the various national meteorological offices as supplementary aid to the ordinary rules which it has taken some half a century's experience to evolve, they have been acknowledged as valuable by eminent meteorologists.

The rules in question are fundamentally three in number, and may be stated thus in our own words:—

(1) Every atmospheric depression which gives rise to winds which are too strong for, or are abnormal by access with respect to, the barometric gradient associated with them, will fill up more or less rapidly—the more rapidly as the excess of velocity is greater; and conversely, a depression surrounded by winds too feeble for the gradient, or such as are abnormal by defect of velocity, will deepen and perhaps develop into a tempest.

(2) A depression will move towards the region of least resistance, which, in the case of a depression surrounded partly by winds abnormal by excess and partly by those abnormal by defect, as defined in (1), is in the direction where the abnormality by defect is greatest. If the depression had, say, winds too strong on its west, south, and east sides, and winds normal for the barometric gradient on the north side, it would be driven to the north, and *à fortiori*, would be so diverted if the wind on this said north side were abnormally weak.

(3) Pressure will rise in a direction, from right to left, normal to the wind which is, proportionally to the gradient, strongest round a depression [which indeed really follows from (2)].

These three main propositions and their numerous subdivisions are discussed and illustrated very fully by their author in the work before us, together with the various critical objections to which they have been subjected. The problem ultimately resolves itself into this: will a cyclonic depression shown on a barometric chart develop or disperse? and in what direction is it likely to be drawn? If a wind on one side of a depression is blowing through any cause in the opposite direction to that which the influence of the said depression would cause it to blow, such a wind illustrates the extreme case of a wind abnormally deficient in velocity with respect to the barometric gradient between it and the centre of the depression, and will invariably attract the depression towards it. Such a wind is called by M. Guilbert a "divergent" wind, and may be illustrated by, say, a north-westerly current over the North sea blowing tangentially away from a cyclonic centre situated to the west of Ireland, or by a westerly wind blowing in a straight line directly away from that centre.

This is what must needs be a very indequate outline of M. Guilbert's empiric rules for what they are worth, or rather, for what they will be found to be worth

as further experience develops and refines them. Had they merely been formulated as a result of long experience of the movements of barometric depressions as depicted on charts, the facts brought to light would, of course, be none the less valuable on that account. But it so happens that the scientific interest of M. Guilbert's work is much enhanced by the fact that his rules are supported, and indeed hydrodynamically explained, by the researches of such eminent physicists as Helmholtz, Lord Kelvin, and Bjerknes, upon the relation of fluid vortices to the medium in which they travel and are engendered. It were, of course, quite impossible to discuss these matters within the limits of a review, and we would refer students of the subject to M. Brunhes' preface to M. Guilbert's book, as well as to his several appendix notes to the same. We are particularly pleased to find M. Guilbert's method thus elucidated in the light of hydrodynamics, for otherwise some of the phrases which M. Guilbert uses to express the interaction between wind currents and centres of high or low atmospheric pressure would have no more than a metaphorical meaning—phrases useful to express the seeming nature of the changes represented on weather charts, but corresponding to no physical reality so far as we might know. We could not, for example, say that a current of air of abnormal velocity impinging upon the side of a circular barometric depression could offer an actual physical barrier to the further progress of the vortex system, and deflect it into another direction (according to the new rule of M. Guilbert), simply because the changes on a chart suggested this physical interaction, unless we were understood to be speaking metaphorically. The hydrodynamic investigations referred to above, however, show that some of M. Guilbert's phrases may be used literally, and it is furthermore to be noted that M. Brunhes has conducted some laboratory experiments, described in one of the appendices referred to, which show conclusively that an artificially produced eddy of air, rendered visible by suitable chemical means, does possess sufficient inertia to be rebuffed and deflected by a jet of air directed against it. The various objections to M. Guilbert's method mainly concern questions of *technique* in synoptic meteorology, and must be left for future workers to remove.

L. C. W. B.

The Explanatory Description of Land Forms.

'Die Erklärende Beschreibung der Landformen.' W. M. Davis. Bearbeitet von Dr. A. Rühl. Leipzig and Berlin. 1912. Pp. xviii., 565. 13 *Plates* and 212 *Figs.* 11 *M.* (*bound* 12 *M.*).

In accordance with the excellent system of the interchange of professors between American and German universities, Prof. W. M. Davis, of Harvard, gave a course of lectures on geography in the University of Berlin during the winter session of 1908–1909, a task which to him was easy owing to his mastery both of German and geography. The lectures have now been made available to a larger audience as the substance of the present work, which develops the principles enunciated by Prof. Davis in his text-book on 'Physical Geography,' and in a valuable series of memoirs. Its publication in German may limit its usefulness, for German students are better provided with first-rate text-books of geography than are available in English; there is Penck's 'Die Morphologie der Erdoberflache,' which is, however, rather systematic than explanatory, and also Prof. Supan's encyclopædic 'Grundzuge der Physischen Erdkunde.' The volume is prefaced by an essay on the methods of American geographical research, of which, according to Prof. Davis, the special characteristic is the

substitution of the recommendation to the student "see and think" for the old advice "go and see."

In the first chapter dealing with the nature and scope of geography, Prof. Davis considers its delimitation from geology. He holds that geography is the geology of the present. Geology is the sum of the whole history of the Earth. Geography is the last chapter of geology. In the present volume Prof. Davis does not deal with the relations between the Earth and man, which according to many authorities is the essential subject of geography, and thus much of the book might be regarded as geology instead of geography. The first chapter deals with the cycle of erosion, and is a clear statement of Prof. Davis' well-known views on this cycle and its effects. He next discusses the frequent contradiction between theories and facts, and develops his deductive scheme of geography; after a description of the simpler land-forms, he proceeds to the more complex structures, including mountains, and to the volcanic land-forms. The three last chapters deal respectively with the desert, glacial, and marine cycles. The volume contains 212 figures in addition to 13 plates, and each chapter is illustrated by many of Prof. Davis' most instructive sketches, and is followed by a list of references extracted from a wide range of literature. It is to be hoped that an English translation of the book will be issued, for owing to its deductive method of treatment it supplies an element which is deficient in much English geographical work.

GENERAL.

Man and his Environment.

'Die Geopsychischen Erscheinungen. Wetter, Klima und Landschaft in ihrem Einfluss auf das Seelenleben dargestellt von Willy Hellpach, Dr. Phil. et Med., Privatdozent der Psychologie in Karlsruhe.' Leipzig: Verlag von Wilhelm Engelmann. 1911. Pp. 368. *Price, sewed, M.6; bound, M.7.20.*

No doubt climate and country exercise an influence on the mind as well as the body, but what this influence is is exceedingly difficult to determine, mind and body being so intimately connected and reacting the one on the other. What is mind? If its modifications are due to rearrangements in the grey matter of the brain, it seems impossible to distinguish between the physical and psychical action of climate and country. The author attempts to distinguish between the physical and chemical effect of weather and climate on the nervous system, the "tonic" effect, and the influence of landscape acting directly on the senses, but he acknowledges that it is often very difficult to distinguish between them, or to decide to what extent a particular mental state is due to either. It is, moreover, impossible to eliminate other factors; change of climate and scenery is generally accompanied by changes in occupation, mode of life, social surroundings, etc., which affect the general result. The impressions of scenery derived from the senses are accompanied by differences of climate, difficulty or easiness in procuring the necessities of life, etc. The author is fully alive to the intricacy of the problem, and does not pretend to do more than collect the facts at present known, pointing out clearly how often false conclusions may be arrived at by neglecting certain factors. All he aims at is to pave the way for future investigation.

THE MONTHLY RECORD.

EUROPE.

Opening of the Loetschberg Railway.—The formal opening, in June, of the railway passing through the Loetschberg tunnel supplies a new and important link in the European lines of communication, and forms a natural complement to the inauguration of the Simplon route eight years ago. While primarily planned in the interests of Bern—which is by it for the first time brought into direct communication with the Rhone valley at Brigue and thence by the Simplon route with Milan and other parts of Italy—the new line will do much to improve the communication with Milan from Northern France, and by it from this country also (cf. *Journal*, vol. 37, p. 461). The journey from Calais *viâ* Nancy and Delle to Milan will be shortened by about three hours, and this route will in future have a decided advantage over that by the St. Gothard. Even Belgium will to some extent share in the gain, through communication having already been inaugurated between Brussels and Milan by Nancy and Bern. It is feared, however, that Ostend and Antwerp may be somewhat detrimentally affected as regards the traffic from England.

Volcanic Eruption in Iceland.—Details respecting the volcanic eruption in the neighbourhood of Mount Hekla, reported from Iceland on April 25, have been received in Germany, and are quoted in the *Zeitschrift* of the Berlin Geographical Society, 1913, No. 6, from a communication by the German explorer Herr Erkes. The chief focus of activity appears to have been the uninhabited lowland north-east of Hekla, where a great fissure 3 miles long was formed, from craters in which lava poured forth and covered the plain. In some cases it shot up in a jet like that of the great geysir, in others it flowed forth like a fiery waterfall. It was quickly cooled, however, by the snow which covered much of the surface. Photographs were secured—the first ever obtained of an eruption in Iceland. The last eruption of Mount Hekla itself took place in 1845.

ASIA.

Origin of the Name "China."—This much-debated question has once more been brought to the front by the researches of the Oriental scholar, Prof. Hermann Jacobi, who has adduced, as an instance of the use of the name in India so far back as 300 B.C., its occurrence in the recently discovered *Kautiliya*, a Sanskrit work ascribed to Kautilya, the famous minister of King Chandragupta. The view generally accepted by scholars has been that the name had its origin in the dynasty of the Tsin (or Chin), which came into power in 247 B.C., and which, under the powerful emperor She-Hwangti, did much to spread the prestige of China among neighbouring peoples. The question is discussed by Mr. B. Laufer, in the light of Dr. Jacobi's discovery, in the *T'oung Pao* for December, 1912, which also contains a further contribution on the same subject by Prof. Paul Pelliot. Mr. Laufer accepts without hesitation the views of Prof. Jacobi both as to the date of the *Kautiliya* and the impossibility of the derivation of the name "China" from the Tsin dynasty. He dwells on the absence of evidence that Tsin was ever used by the Chinese themselves as a name for their own people or country, independently from the Indian designation *Cina*, into which the Chinese vocable was in all probability read subsequently, owing to the similarity in sound. Referring to the dual designation for China which so long prevailed among more Western nations according as the tidings of it came by the land or sea route, he adopts the view that *Cina* may have been the ancient (perhaps Malayan) name adhering to the coast of

Southern China. Prof. Pelliot (whose article was written with previous knowledge of Mr. Laufer's contribution) thinks it at least premature to reject the currently accepted view, which he champions with considerable force. Without questioning the high competence of Prof. Jacobi on matters Indian, he thinks the authenticity of the *Kautiliya* has not been satisfactorily established, while various facts (including some brought to light by him for the first time) tend to confirm the connection between *Cina* and the *Tsin*. He shows that the opening of commercial relations between China and the Indian ocean by the maritime route was of later date than Mr. Laufer supposes, and thinks that it was the victories of She-Hwangti which first gave the Hindus anything but a vague knowledge of their eastern civilized neighbours, and this by the land rather than the sea route. Even though the Chinese never called themselves after the Tsin dynasty (as they did by that of the Han), the adoption of the former name in India would be quite natural if the tidings came when that dynasty was actually reigning. Prof. Pelliot brings forward evidence that the name "Men of the Tsin" was for some time actually in use in Central Asia also (among the Hiung-Nu) as the designation of the Chinese, thus supplying a new parallel to the designations Tabgach (or Tamghaj; cf. Yule's 'Cathay,' pp. lii. *seq.*) and Khitai by which they were known later in the same quarter. If the date 300 B.C. be substantiated for the *Kautiliya*, he considers that it was the state of Tsin in Shansi (anterior to the dynasty of the same name) that, through its contact with the Central Asian populations, gave currency to this designation for the Chinese.

AFRICA.

Cotton Cultivation in the Sudan.—In view of the interest in this subject which has been aroused within the past few years, an article in the *Bulletin of the Imperial Institute* (vol. 11, No. 2) taking stock of the progress so far made, is particularly opportune. The chief areas where cotton is at present being cultivated are the Tokar district of the Red sea province, parts of the Kassala province, the Wad Medani and other districts of the Gezira plain, and along the Nile between Khartum and the Atbara. The last-mentioned district is the only locality where systematic irrigation is practised, apart from experimental areas, but a far-reaching scheme for irrigating a large part of the Gezira plain has been set on foot, and the payment of interest on a loan of £3,000,000 for this and allied objects has, it will be remembered, been guaranteed by the British Government. In order not to adversely affect the irrigated area in Egypt, irrigation in the Gezira will be permitted only between July 15 and the end of the following February. The first experiment, begun in 1911, is being carried out at Tazíba, north of Wad Medani, where irrigation is provided from the Blue Nile by means of pumps. Both Mitafifi and Nubari cotton has been grown, the former having so far given the best result, the produce being pronounced by experts to be far superior to that obtained in Egypt, and to be just what is required by Lancashire. In the Tokar district a large acreage has been planted in the last two seasons, on land flooded by the annual overflow of the Baraka river. The yield in the first season exceeded 11,000,000 lbs. of seed-cotton, and is expected to be considerably higher from the next. The Mitafifi variety is now adopted here, and, with improvement in the cultivation and picking, has given a cotton of much better quality than heretofore. The total value of the cotton produced in this district has risen from £15,575 in 1904–5 to almost £150,000 in 1910–11, and this in spite of a fall in price in the last-named year. From the whole of the Sudan, the export of ginned and unginned cotton reached a value of £242,000 in 1911. The proportion ginned in the

country has lately risen greatly, reaching 82·5 per cent. in 1911. The results from the Berber province have not yet been altogether favourable, and the methods of culture and transport need improvement in the Kassala province, where a large area could be irrigated from the river Gash.

The Volume of the Victoria Nile.—The following hitherto unpublished results of two measurements of the volume discharged by the Victoria Nile have been forwarded to us by Mr. E. M. Dowson, Director-General of the Egyptian Survey Department. They were made in August, 1907, by Messrs. L. B. Weldon and W. J. Maule of the same department, at Fajao in Uganda. As originally given, the figures were in metres only, but we have added the equivalent values in feet (within brackets) for the convenience of those who are more accustomed to English measures.

VOLUMES DISCHARGED BY THE VICTORIA NILE AT FAJAO, UGANDA, AUGUST 1907, IN CUBIC METRES PER SECOND.

(Equivalent values in feet given in brackets.)

No.	Date.	Mean velocity M.p.s. as determined.	Position of mean velocity below surface in metres.	Cross-section in square metres.	Width in metres.	Mean depth in metres.	Greatest depth.	Discharge C.M.p.s.
1	27–8–1907	0·6036 (1·98)	0·41 (1·35)	1566 (16,858)	132 (433)	11·9 (39)	23·45 (77)	957 (33,800)
2	28–8–1907	0·6024 (1·97)	0·41 (1·35)	1560 (16,793)	132 (433)	11·8 (38·7)	23·50 (77)	986 (32,780)

Demarcation of the Kamerun Frontiers.—The work of demarcation of the frontiers of the Kamerun with both the British and French territories surrounding it has been pushed forward energetically during the past year. On the side of Nigeria, where the work was under the charge of Captain Nugent, R.A., and Hamptmann Detzner, the northern section was completed in February, and the southern in April, the two commissions having since returned to Europe. As already mentioned in the *Journal* (vol. **40**, p. 644) the operations for the survey of the frontier of "New Kamerun" (as the territory ceded by France by the agreement of 1911 is now generally known in Germany) were placed in the hands of a number of separate parties, both French and German, and, according to reports received in Europe and published from time to time in the colonial papers of the two countries, a large amount of valuable geographical material has resulted from their labours. Most of the parties have now completed their tasks, though one of the German parties, working on the southern frontier between Monda bay and the Jua, was not expected to have finished until the middle of September. This party undertook the determination of longitudes by wireless, and though the operations for this end are said to have been tedious and difficult, some success was attained, signals from the wireless station at Duala being received at various points. Some opposition from the natives was encountered, and it was necessary to take measures of reprisal against the Mpangwe, in which a German non-commissioned officer lost his life. On the eastern frontier, too, one of the members of the party at work between the Logone and the Pama, Dr. Houy, fell a victim to a murderous attack. The French party which had to deal with this part of the frontier, headed by M. Périquet, is said to have

traversed an entirely unknown district in the basin of the Mpoko (a right-bank tributary of the Ubangi) and its affluents, inhabited by the Baya race. The country here falls in steps from the granite plateau of Yade, and is said to be fertile and healthy. The various detachments have carried out researches into the physical geography, ethnology, and economic resources of the regions traversed.

Atmospheric Dust during Harmattan.—The origin and composition of the dust suspended in the atmosphere during the Harmattan period in West Africa has long been a matter of discussion, some holding the dust to be derived chiefly from the annual grass-burnings which take place during the period in question; others that it consists of fine particles brought by the north wind from the desert. With a view to solving the question a plan was devised by Dr. Kersting in Togo, by which large quantities of air should be collected by a suction-apparatus on days of pronounced Harmattan haze, and the solid particles separated out by filtration. Dr. Kersting was transferred from Togo to Yap without being himself able to carry out the experiments, but the plan was taken up energetically after his departure by Baron von Siefried, chief of the Station Mangu-Yendi, who, in spite of his official duties, carried out the tedious operations necessary to the experiment on five different occasions, and reports on the results in the *Mitteilungen aus den Deutschen Schutzgebieten*, 1913, No. 1. Of the five experiments, three only were continued long enough ($62\frac{1}{2}$, $25\frac{1}{2}$, and $61\frac{1}{2}$ hours) to give quite satisfactory results. Two of these (like the other two of shorter duration) were carried out at the station at Sansane Mangu, the third on a mountain top at a distance, with a view to avoiding as far as possible the inclusion of earthy matter from the neighbouring country. Even so it is not easy to exclude this altogether by reason of the strong ascending air-currents which prevail on a mountain. While all the experiments were made during the Harmattan period (September to March, 1911–12), and on days of marked haze, a part were carried out at the time of the most frequent grass-burnings, the rest after these had ceased for some time. The tubes containing the solid matter filtered from the air samples have been submitted for examination to the Geological Office for the German Colonies, whose report is appended to Baron von Siefried's. The deposit obtained from the mountain top was a fine greyish-white powder, which on analysis gave no trace of substances to be expected on the hypothesis of derivation from the ashes of plants. On the other hand, a microscopic examination showed the bulk of the powder to be composed of *débris* of diatoms, mineral components being unimportant. A sample from the station showed particles of charcoal even to the naked eye, but here too plant cells and diatom remains were found to be present in considerable quantities. It is therefore concluded that diatom fragments constitute the most important constituent of the Harmattan dust—a result which agrees well with previous determinations in the case of Trade wind dust. Further examination by diatom specialists might, it is thought, throw more precise light on the place of origin of the dust.

The Hydrography of Lake Chad.—Commandant Tilho, whose return last year to the Lake Chad region was announced at the time in the *Journal*, has sent home some notes on his observations of the *régime* of the lake down to May last. The level of the lake, as recorded by the gauge at Bol, reached its maximum for the year in November, 1912, when the water had re-occupied the whole of the basin, and the northern portion presented the same appearance as in 1904. Navigation was still difficult, however, in this northern part, and a barrier of vegetation still separated it from the south part of the lake. In

the south the swell raised by the easterly winds formed the only serious difficulty. With a view to throwing light on the underground circulation, observations had been made of the water-level both in the well at Mao and of various swampy expanses, which had maintained their level and even risen during a completely dry period. In one case the maximum was reached on February 20, three months after the highest stage had been reached in the main lake. A study of the depressions to the east and north-east of Chad had been made by Captain Vignon, who had proved the continuity of the Bahr-el-Ghazal channel to a point north of Endi, and native information had been obtained to the effect that it is prolonged far to the east, making a circuit of the Endi massif and receiving tributaries. Commandant Tilho hopes in time to explore this region with a view to solving the question of a possible former connection between Lake Chad and the Nile. Attempts at longitude determination by picking up the Eifel Tower signals had not so far met with success, a disturbing element being the nightly hum of mosquitoes.

AMERICA.

Gold Discovery in Alaska.—A new discovery of gold in considerable quantity has been reported from Alaska, the site being about 30 miles from the Canadian boundary and 300 north of White Horse. At present there are only about seventy white men in the district, but a rush is said to have begun already.

Forestry in New York State.—The issue for February, 1913 (Series XIII., No. 1A), of the *Bulletin* of New York State College of Forestry, at Syracuse University, discusses the "Reforestation of cut-over and idle lands" in that State. The college is a State institution established and supported for educational work, and with the true American zeal for practical ends, confers the degree of "Master of Forestry" (M.F.)—a qualification the like of which would in England simply be called a specialized diploma, and not dignified with the name of degree at all. The institution is busily concerned with the progress of forestry in New York as a branch of agriculture, and the *Bulletin* before us draws attention to the large extent of actually waste land in the State which ought to be producing valuable timber. The verdict of the New York State Census Bureau is to the effect that out of the 34,000,000 acres comprising it, 12,000,000 are better suited for the growing of timber than for any other purpose, but that of these nearly 2,000,000 are waste land. Statistics further show that out of the 22,000,000 acres enclosed within farms, only 15,000,000 are actually in agricultural crops, leaving 7,000,000 acres idle—an unproductive area of farm land larger than the state of Massachusetts. These extensive tracts formerly supported valuable forest, but the trees have either been cut and not replanted, or else been destroyed by fire. If left to herself, Nature might succeed in re-establishing a good forest, but this would seldom be the case, and the process would in any case be more or less tardy. The forests should never have been allowed to become denuded, but, such being the case, the most profitable course to adopt is that of planting rapid-growing conifers like some pines and spruces. Too much of the "idle land" in New York is enclosed within farms, and there are very few farms which do not contain many acres better suited for growing timber than crops. If such lands occupying barren slopes and rocky hillsides are stripped of their trees, they suffer much erosion and become a menace to the cultivated lands below, so that whenever timber is cut the land should be replanted at once. Every farmer and landowner in the State should consider the desirability of growing timber on any such waste lands as they may have.

To encourage this movement, a State Law, passed in 1912, allows exemption from taxes upon certain classes of land which are under forest or maintained as permanent woodland. It is now coming to be recognized that a judiciously planted forest has a definite value however small the trees are, and that it is possible to draw very early upon the growing timber for a return. As very barren hills in Germany and Austria are producing valuable timber under scientific sylviculture, the College of Forestry considers that the outlook for New York, where the climatic conditions are much more favourable than among the highlands of Central Europe, is exceedingly promising.

POLAR REGIONS.

Danish Expedition across Greenland.—The Danish expedition under Captain Koch, which set out in June, 1912 (*Journal*, vol. **39**, p. 616; **40**, p. 566), with a view to crossing the inland ice of Greenland at about its widest part, has successfully accomplished its object in the face of considerable difficulties. It is reported from Copenhagen that the party reached the west coast at Proeven near Upernivik, when just at an end of its resources. After being landed on the ice on the north-east coast on July 24, 1912, the party made an unsuccessful attempt to reach Queen Louise Land, and Captain Koch therefore decided to winter on the inland ice. During a sledge expedition to Queen Louise Land, at the end of October, the leader had the misfortune to break his leg through falling into a crevasse, and was laid up for three months. During the winter the temperature was generally 50° below the freezing-point (? Centigrade). Only in March could sledge work be resumed, and on April 20 the expedition started with five sledges and five horses (the rest had previously been slaughtered) to cross the ice to the west coast. During the first forty days the weather was extremely bad. On July 11 the last horse but one had to be killed, and on the next land was sighted. The food now gave out, and, the weather being extremely bad, the party remained for thirty-five hours without food under the shelter of a rock. Too exhausted to proceed, the explorers killed their dog, and were about to eat the flesh when they saw a sailing boat on the fiord east of Proeven. By means of shots and signals they were able to attract the attention of those on board, among whom was the owner, Pastor Chemnitz, by whom they were taken to Proeven and hospitably entertained. Both Captain Koch and his companion Dr. Wegener are capable observers, and good scientific results may be expected. Koch's is the fourth crossing of Greenland from side to side yet effected, the others being those of Nansen, Peary, and De Quervain (*Journal*, *loc. cit.*). It is probably the finest achievement of all, owing to the great width of the inland ice at this latitude. The highest point of the route is said to have been 9000 feet above sea-level.

The French and Russian Expeditions to Franz Josef Land.—The expedition organized by M. Jules de Payer (*Journal*, vol. **41**, p. 289) for the scientific exploration of the north-eastern part of Franz Josef Land sailed from Havre on August 10, intending to winter at Vardö after taking in supplies at Bergen. Anxiety is felt in Russia as to the safety of the party under Captain Sedov, which, it will be remembered, went north to the same part of the Arctic Region in the late summer of 1912—with an insufficient equipment, according to the judgment of experts. Rumours of disaster were current towards the end of the year, but no definite information appears to have yet come to hand. The Russian Government has been urged to take steps for the despatch of a relief expedition, but has declined to move in the matter, holding the view that Sedov, if unable to reach Franz Josef Land, has probably wintered in Novaya Zemlya.

Expeditions to the Siberian Arctic Seas.—Much activity is being shown in various quarters in promoting the exploration of the northern Siberian coasts and seas. We learn from *Petermanns Mitteilungen* that early in July a Russian expedition, under Major-General Sergeief, left Vladivostok in the ice-breakers *Taimyr* and *Vaigatz* with the purpose of making its way to the Lena, and if possible continuing the voyage round the Taimyr peninsula and through the Kara sea to Europe. An enterprising Norwegian sailor, Captain J. Korén, last year made the voyage from Bering strait to the Kolyma in a small sailing ship, the *Kittiwake*, which he lost, however, when attempting the return voyage. After returning to Bering strait in boats, and wintering there among the Eskimo, he reached Nome, Alaska, early in the present year. In the western section, too, some activity is being shown. A vessel is reported to have left Stettin in July on a commercial venture, with the mouth of the Ob as objective. The peninsula to the east of the Ob is to be the scene of explorations by a Russian botanist, Dr. Richard Pohle, supported by the Tobolsk Museum, the St. Petersburg Academy, and the Botanical garden in the same capital. Two vessels have also sailed for the Kara sea to continue the operations, begun in 1912, for the erection of wireless telegraphy stations in that region. The German "Taimyr-land expedition" is referred to below (p. 301).

The Canadian Arctic Expedition.—News from Mr. Stefansson was received in Toronto from Alaska about the end of July. Of the three vessels employed, two—the *Karluk* and the *Mary Sachs*—had already sailed from Port Clarence, while the third—the *Alaska*—was to follow shortly and overtake the others at Herschel island. The expedition includes in all fifteen scientists and twenty-two others, including the captains of the vessels. The outfit is sufficient for two years or more and it is stated that no anxiety need be felt if the *Kasluk* is not heard of for that space of time. The other two vessels should be heard from twice yearly.

Medals to Members of the Scott Expedition.—On July 26 the King received at Buckingham Palace the members of the Scott Expedition and presented them with the Antarctic Medal and Clasp. His Majesty also presented Lady Scott, Mrs. Wilson, Mrs. Evans, and Mrs. Brissenden with the medal and clasps which had been awarded to their late husbands, and to Mrs. Bowers the medal and clasp awarded to her son, the late Lieut. H. R. Bowers, R.I.M. At the request of the late Captain Oates's mother, the medal and clasp awarded to her son were received on her behalf by Commander Evans. A few of the members of the expedition, including Mr. G. C. Simpson, were unavoidably prevented from attending, either through residence abroad or through illness. The King also decorated Chief Stoker W. Lashley, R.N., and Petty Officer T. Crean, R.N., with the Albert Medal of the Second Class for gallant conduct, as described by Commander Evans in his lecture at the Albert Hall.

Austrian Antarctic Expedition.—It is announced that an Austrian Expedition is being organized on a considerable scale to continue the work of the second German Antarctic Expedition under Dr. Filchner, which returned north at the end of last year (*Journal*, vol. 41, p. 356). According to a note in the *Zeitschrift* of the Berlin Geographical Society (1913, No. 6), its leader is Dr. Felix König, who has had Polar experience both in Greenland and as a member of the recent German expedition, besides being an accomplished Alpinist. The committee formed for the furtherance of the scheme (which has Count Wilczek as Hon. President and Prof. Oberhummer as President) has already purchased the *Deutschland*, Dr. Filchner's ship—and it is proposed to start in May, 1914. The route will again be that of the

Weddell sea, and it is hoped (after investigating the connection between Coats Land and Luitpold Land *en route*) to establish winter quarters in the latter, and to prepare the way for an eventual advance south by laying depôts. Three sledge expeditions are planned for the investigation of the region round the Weddell sea, the most important being that to the southward, following the line of the escarpment of the inland ice discovered by Filchner, by which route it is hoped to ascertain the relations of West Antarctica to the Queen Maud range of Amundsen. A full scientific programme, including oceanographical work on the outward voyage, will be laid down, and the leader hopes to secure the help of competent experts.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Ocean Currents.—We have received the following comment from the veteran writer on ocean currents, Mr. Leighton Jordan, *à propos* of the note on a recent publication of Mr. McEwen which appeared in the August number: "On pages 199 and 200 of the August number you have a discussion on 'Cold Surface Water on the West Coast of North America,' the object of which seems to be to explain how the cold water is placed there by the action of the winds. Forty-seven years ago I offered a paper to the Geographical Society showing that a massive movement of the ocean from east to west in the equatorial regions, and from west to east in the temperate zones, is caused by a conflicting action of astral and terrestrial gravitation. The circulation being due to a movement in mass, not to mere surface drift caused by the winds, there is a tendency, wherever the moving mass reaches shallows near the land, for the bottom strata to be forced upwards. Precisely similar phenomena are found on the west coast of Ireland. In the equatorial regions that action is still more clearly shown by changes in the character of the water on the coasts of Brazil, Australia, and New Guinea, as the land is approached from deep parts of the ocean."

GENERAL.

Memorial to Baron Toll.—A memorial to the lost Russian explorer, Baron E. von Toll, is to be set up on the west coast of Kotelnyi island, in the New Siberia group—the starting-point of the explorer and his companions on their last journey into the unknown, from which they never returned. The May number of *Petermanns Mitteilungen* contains a photographic reproduction of the bronze tablet which has been executed for this purpose by the young Charlottenburg sculptor, Martin Müller. It shows the traveller's portrait in relief, and also contains a suitable inscription. The tablet will be fixed to a stone pillar, and will be set up on Kotelnyi island by the leader of the German "Taimyr-land Expedition," Herr Oskar Iden-Zeller, who earlier in the year was making preparations for a northern expedition with dog sledges at Ustyansk, in northern Siberia.

OBITUARY.

Sir James Lamont.

ONE of an older generation of Arctic voyagers passed away on July 29 in the person of Sir James Lamont, of Knockdow, Argyll, who had reached the advanced age of eighty-five years. Sir James undertook his voyages to the far north rather for the sake of sport, to which he was passionately devoted, than

of exploration, though he attacked a geographical problem by his attempts to reach the Wiche's Land of the old navigators, east of Spitsbergen, about the identification of which considerable differences of opinion have from time to time prevailed. His first voyage to Spitsbergen was made in 1858, and some years later, after sitting in Parliament for three years as member for Buteshire, he built a vessel specially adapted for Arctic work, which he named the *Diana*. This was launched in 1869, in which and the two subsequent years he made no fewer than four different voyages to Spitsbergen and Novaya Zemlya, then far less frequented by voyagers than they have become of late years. Sir James had also travelled for the sake of sport in South Africa. He was formerly a Fellow of this Society, but resigned some fifteen years ago.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.k = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

EUROPE.

Adriatic. *Verh.* 18. *Deutschen Geographentages Innsbruck*, 1912: 3–25. **Brückner.**
Bericht über die hydrographischen Ergebnisse der österreichisch-italienischen Erforschuug der Hochsee der Adria im Jahre 1911–12, erstattet im Auftrage des Vereins zur Förderung der naturwissenschaftlichen Erforschung der Adria in Wien. Von Prof. Dr. Eduard Brückner. *Illustrations.*

Adriatic. *G.Z.* **90** (1913): 129–136. **Krebs.**
Die strategischen Punkte der adriatischen Ostküste. Von Dr. Norbert Krebs.

Alps, Eastern. *M.k.k.G. Ges. Wien* **56** (1913): 39–57. **Götzinger.**
Zur Frage des Alters der Oberflächenformen der östlichen Kalkhochalpen. Von Dr. Gustav Götzinger. *Illustrations.*

Alps—Geomorphology. **Sölch.**
Verh. 18. *Deutschen Geographentages Innsbruck*, 1912: 128–141.
Ein Beitrag zur Geomorphologie des Steirischen Randgebirges. Von Prof. Dr. Johann Sölch.

Alps—Glaciers. *Jb. Schweizer Alpenclub* **47** (1911-12): 231–247. **Forel and others.**
Les variations périodiques des glaciers des Alpes suisses. Par Dr. F. A. Forel, E. Muret et Dr. P. L. Mercanton. *Illustration.*

Alps—Ice-age. **Lepsius.**
Verh. 18. *Deutschen Geographentages Innsbruck*, 1912: 155–165.
Ueber die Einheit und die Ursachen der Eiszeit in den Alpen. Von Prof. Dr. Richard Lepsius.

Alps—Lakes. *Met. Z.* **30** (1911): 209–213. **Maurer.**
Ueber die Grösse der jährlichen Verdunstung auf Schweizer Seen am nordalpinen Fuss. Von J. Maurer. *Sketch-map.*

Alps—Structure. **Kober.**
Sitzb. K.A.W., Mathemat.-Naturwissens. Kl. **120** (1911): 1115–1124.
Der Aufbau der östlichen Nordalpen. Von Leopold Kober. *Sketch-map.*

Alps—Sunshine. *Met. Z.* **29** (1912): 561–569. **Maurer.**
Aus älteren und neueren Messungen der Sonnenstrahlung auf hochalpinen Stationen. Von J. Maurer. *Diagram.*

Alps—Valleys. *M.G. Ges. München* **7** (1912): 1–126. **Distel.**
Die Formen alpiner Hochtäler, insbesondere im Hohen Tauerngebiet, und ihre Beziehungen zur Eiszeit. Von Dr. L. Distel. *Map and Illustrations.*

Alps—Valleys. **Distel.**
Verh. 18. *Deutschen Geographentages Innsbruck*, 1912: 141–155.
Zur Entstehung des alpinen Taltroges (am Beispiel der Hohen Tauern). Von Dr. L. Distel.

Austria—Bosnia. *M.K.K.G. Ges. Wien* **56** (1913): 15–38. **Toula.**
Eine Reise in das westliche Bosnien. Von Franz Toula. *Illustrations.*

Austria—Bosnia and Herzegovina. **Stavenhagen.**
Bosnien und die Herzegovina. Von W. Stavenhagen. (Sonderabdruck aus Nr. 161–164 des Militär-Wochenblattes 1912.) Berlin, 1912. Size 11 × 8, pp. 8.

Austria—Dalmatia. *M.K.K.G. Ges. Wien* **55** (1912): 468–474. **Götzinger.**
Zur Morphologie der Dinara in Dalmatien. Von Dr. Gustav Götzinger.

Balkan Peninsula. *Ann. de G.* **22** (1913): 41–67. **Gravier.**
Le Sandžak de Novi Pazar. Par Gaston Gravier. *Sketch-maps.*
See abstract in vol. **41**, p. 468.

Balkan Peninsula—Ethnography. **Cvijić.**
Petermanns M. **59** (1913) I.: 113–118, 185–189, 244–246.
Die ethnographischen Abgrenzung der Völker auf der Balkanhalbinsel. Zur ethnographischen Karte der Balkanhalbinsel von Prof. Dr. Jovan Cvijić. *Map.*

Carpathians—Earthquakes and Structure. **Lozinski.**
Beiträge Geophysik **12** (1912): *Kleine M.* 16–26.
Das seismische Verhalten der Karpathen und ihres Vorlandes. Von W. v. Lozinski. *Sketch-map.*

Carpathians—Glaciation. **Sawicki.**
Glaziale Landschaften in den Westbeskiden. Von L. Sawicki. (Extrait du *Bulletin* de l'Académie des Sciences de Cracovie. Classe des sciences mathématiques et naturelles. Série A: Sciences mathématiques. Février 1913.) Cracow, 1913. Size 9½ × 6½, pp. 87. *Map and Illustrations.*

Central Europe—Boundary. **Stolz.**
Verh. 18. *Deutschen Geographentages Innsbruck*, 1912: 114–127.
Die geschichtliche Entwicklung der bayerischtirolischen Landesgrenze. Von Dr. Otto Stolz.

Central Europe—Triangulation. **Schmidt.**
Sitzb. Mathemat.-physikal. Klasse K. Bayer. A. W. München, 1912: 191-208.
Neuberechnung des Anschlusses der südbayerischen Dreieckskette an die österreichische Triangulierung bei Salzburg und scheinbare Verschiebung der Hauptdreieckspunkte Watzmann und Rettenstein. Von M. Schmidt. *Illustrations.*

France—Gascony—Dunes. *C.R.A. Sc. Paris* **156** (1913): 496–498. **Welsch.**
Les dunes primaires de Gascogne; explication de leur formation. Par Jules Welsch.

France—Hérault. *B.S. Languedocienne G.* **35** (1912): 189–283. **Roman and Gennevaux.**
Etude sur les Terrains jurassiques de la région du Pic Saint-Loup (Hérault). Par F. Roman et M. Gennevaux. *Section and Illustrations.*

France—Hydrology. *Spelunca* **9** (1912): No. 70, pp. 32. **Fournier.**
Recherches spéléologiques et hydrologiques dans la chaine du Jura. Par E. Fournier. *Sketch-maps and Sections.*

France—Noirmoutier island. *La G., B.S.G. Paris* **27** (1913): 1–32. **Clouzot.**
Les modifications littorales de l'île de Noirmoutier. Par Étienne Clouzot. *Maps and Sections.*

Germany—Historical. **Schmidt.**
Geschichte der deutschen Stämme bis zum Ausgange der Völkerwanderung, II. 2. Von Prof. Dr. Ludwig Schmidt. (Quellen und Forschungen zur alten Geschichte und Geographie, herausgebeben von W. Sieglin, Heft 27.) Berlin, [1913]. Size 10 × 6½, pp. 95–220.

Greece—Gulf of Corinth. *C.R.A. Sc. Paris* **156** (1913): 427–431, 659–663. **Depéret.**
Observations sur l'histoire géologique pliocène et quaternaire du golfe et de l'isthme de Corinthe. Par Charles Depéret.

Hungary—Budapest. **Leiter.**
Budapest und die Oberungarische Donau. Von Dr. Hermann Leiter. (Sonder-Abdruck aus dem Geographischen Jahresbericht aus Oesterreich, IX. Jahrgang.) Vienna and Leipzig, 1912. Size 9½ × 6½, pp. 44. *Sketch-map, Section, and Illustrations.*

Italy—Venetia—Rivers. [Rava.]
Notices sur le Bureau Hydrographique du "Magistrato alle Acque" et sur quelques-unes des principales systémations fluviales en cours dans la Vénétie. Venice, 1913. Size 10½ × 7½, pp. 74. *Maps and Illustrations.*
See note in the August number, p. 193.

Mediterranean—Seismology. **Omori.**
B. Imp. Earthquake Investigation Committee **5** (1913): 87–100.
On the recent sea-level variation at the Italian and Austrian marcograph stations, and on the cause of the Messina-Reggio earthquake of 1908. By F. Omori. *Sketch-map and Diagrams.*

Northern Europe—Geology. **Geer.**
Kontinentale Niveauveränderungen im Norden Europas. Von Gerard De Geer. (Extrait du *Compte Rendu du XI^e^ Congrès Géologique International*, 1910.) Stockholm, 1912. Size 9½ × 6½, pp. 849–860. *Map.*
Printed also in *Petermanns Mitteilungen*, 1912 (cf. *Journal*, vol. **40**, p. 647).

Norway. *Quart. J. Geol. S.* **69** (1913): 19–26. **Monckton.**
On the Hafslo Lake and the Solvorn Valley (Norway). By Horace Woollaston Monckton. *Plates and Illustrations.*

Norway—Earthquakes. **Kolderup.**
Bergens Museums Aarbok **1912** (1913): No. 11: 1–38.
Jordskjaelv i Norge i 1911. Anhang: Registrierungen an der seismischen Station in Bergen im Jahre 1911. Av Carl Fred Kolderup. *Map and Sketch-map.*

Norway—Glaciers. *Bergens Museums Aarbok* **1912** (1913): No. 5: 1–5. **Rekstad.**
Forandringar ved norske bræer i aaret 1911–1912. Av J. Rekstad.

Norway—Lofoten islands. *Norske G. Selskaps Aarbok* **23** (1913): 1–50. **Vogt.**
Landskapformerne i det ytterste av Lofoten. En geomorfologisk studie. Av Thorolf Vogt. *Illustrations.*

Rumania—Kustenji. *B.S.G. Com. Paris* **35** (1913): 5–22. **Saint-Sauveur.**
Le Port de Constantza. Par J. de Saint-Sauveur. *Plan.*

Russia—Crimea—Sudak. *M.S. Naturalists Kieff* **22** (1912): 1–88. **Andrussov.**
Die Terrassen von Sudak. Von N. Andrussow. [In Russian; German *résumé.*] *Illustrations.*

Russia—Finland—Åland islands. *Fennia* **28** (1909–1910): 1–56. **Hausen.**
De gamla strandbildningarna på Åland och deras förhållande till Stenålders-boplatserna. Af H. Hausen. [With an English *résumé.*] *Map.*

Russia—Finland—Åland islands. *Fennia* **28** (1909–10): 1–37. **Hausen.**

Orografiska studier på Åland med särskild hänsyn till Rapakiviberggrunden och dess förklyftningsförhållanden. Af H. Hausen. (With an English *résumé*.) *Map.*

Russia—Finland—Morphology. *Fennia* **28** (1909–10): 22–30. **Sederholm.**

Sur la géomorphologie de la Finlande. Par J. J. Sederholm.

Russia—Finland—Statistics. *Fennia* **28** (1909–10): 3–22. **Alfthan.**

Cartes statistiques de la Finlande. Par Max Alfthan.

Russia—Northern. *Iz. Archangel S. Russian North* (1911): 282–312. **Juravski.**

The north of European Russia. By Andrei Juravski. *Illustrations.* [In Russian.]

Russia—Surveys. *Zap. Hydrography* **34** (1912): 166–184. **Vitram.**

On the base line near Reval, measured in 1911. By Th. Vitram. [In Russian.]

Russia—Waterways. **Solovkin.**

Marine Magazine (*Russia*) **372** (1912); **373** (1912): *passim*, pp. 92.

From the Baltic to the Caspian Sea on the gunboat *Ardagan*. By Dr. H. Solovkin. *Illustrations.* [In Russian.]

Spain—Geology. **Hernández-Pacheco.**

Ensayo de Síntesis Geológica del Norte de la Península Ibérica. Por Eduardo Hernández-Pacheco. (Trabajos del Museo de Ciencias Naturales, No. 7.) Madrid, 1912. Size 9 × 7, pp. 133. *Illustrations.*

Spain—Geology. **Hernández-Pacheco.**

Itinerario Geológico de Toledo á Urda. Por Eduardo Hernández-Pacheco. (Trabajos del Museo de Ciencias Naturales, No. 1.) Madrid, 1912. Size 9½ × 7, pp. 46. *Map and Illustrations.*

Spain—Physiography. **Cereceda.**

Resumen Fisiográfico de la Península Ibérica. Por Juan Dantín Cereceda. (Trabajos del Museo de Ciencias Naturales, No. 9.) Madrid, 1912. *Sketch-map and Illustrations.* Size 9 × 7, pp. 275.

Sweden—Historical. **Beckmann and Fries.**

Johann Beckmanns Schwedische Reise, in den Jahren 1765–1766. Tagebuch mit Einleitung und Anmerkungen . . . herausgegeben von Th. M. Fries. Upsala, 1911. Size 10 × 6½, pp. iv. and 174. *Portrait and Facsimile.*

From an unpublished manuscript journal of the traveller. The journey was undertaken with a view to studying the mining industry of Sweden, and of attending the classes of Linnæus.

United Kingdom—Anthropology. **Dawson and Woodward.**

Quart. J. Geol. S. **69** (1913): 117–151.

On the Discovery of a Palæolithic human skull and mandible in a Flint-bearing Gravel overlying the Wealden (Hastings Beds) at Piltdown, Fletching (Sussex). By Charles Dawson and Arthur Smith Woodward. With an Appendix by Prof. Grafton Elliot Smith. *Sketch-map, Plates, and Illustrations.*

United Kingdom—Devon. *Geol. Mag.* V. **10** (1913): 154–163. **Dewey.**

The raised beach of Northern Devon: its relation to others and to Palæolithic Man. By Henry Dewey.

United Kingdom—Devon. *Geol. Mag.* V. **10** (1913): 106–108. **Hunt.**

The Age of the Torbay Raised Beaches. By A. R. Hunt.

United Kingdom—Eastern Counties—Rain. **Mill.**

Quarterly J.R. Meteorological S. **39** (1913): 1–28.

Unprecedented rainfall in East Anglia, August 25–26, 1912. By Dr. Hugh Robert Mill. *Sketch-maps.*

United Kingdom—Geology. *Quart. J. Geol. S.* **69** (1913): li.–xci. **Strahan.**

The Anniversary Address of the President, Aubrey Strahan, SC.D., F.R.S. [chiefly on] "The form and structure of the Palæozoic platform on which the Secondary rocks of England rest." *Maps.*

United Kingdom—London. **Barrow and Wills.**

Memoirs of the Geological Survey, England and Wales. Records of London wells. By G. Barrow and L. J. Wills. London, 1913. Size 9½ × 6, pp. 216. *Maps, Section, and Diagram.*

United Kingdom—Scotland. *Scottish G. Mag.* **29** (1913): 67–87, 133–148. **Saunders.**
A geographical description of Fife, Kinross, and Clackmannan. By Lawrence J. Saunders. *Sketch-maps.*

United Kingdom—Scotland—Sutherland. **Crampton.**
Scot. G. Mag. **29** (1913): 256–266.
The Plant Ecology of Ben Armine (Sutherlandshire). By C. B. Crampton. *Diagrams. Also separate copy, presented by the Author.*

United Kingdom—Wales and Devon. **Sawicki.**
Die Einebnungsflächen in Wales und Devon. Von Ludomir Sawicki. (Separat-Abdruck aus den Sitzungsberichten der Warschauer Gesellschaft der Wissenschaften, 1912, Lieferung 2.) Warsaw, 1912. Size 9½ × 6, pp. 112–134. [In Polish and German.]

United Kingdom—Watling Street. *P.S. Antiquaries* **24** (1911–12): 137–146. **Page.**
Some notes on Watling Street and its relation to London. By William Page. *Plan.*

ASIA.

Central Asia. *J.G. Tōkyō G.S.* **24** (1912): 599–608, 682–698. **Tachibana.**
Exploration in Central Asia. By Z. Tachibana. *Map.* [In Japanese.]

China—Geology and People. *Popular Sc. Monthly* **82** (1913): 105–124. **Blackwelder.**
The geologic history of China and its influence on the Chinese People. By Prof. Eliot Blackwelder. *Sketch-map, Sections, and Illustrations.*

China—Tibet. **Chang Shên An, and Sperlein.**
M. Seminars Orient. Sprachen **15** (1912): [Pt. i.] 118–161.
Von Ta Chien Lu nach Tibet, Lu Ts'ang Tao Li Tsui Hsin T'u K'ao. Von Chang Shên An, übersetzt von T. Sperlin. *Map.*
Description of the route and country traversed, by the secretary to a Chinese high official in Tibet, with notes and introduction by the latter.

China—Yunnan. *M. Seminars Orient. Sprachen* **15** (1912): [Pt. i.] 1–57. **Weiss.**
Die Provinz Yunnan, ihre Handels- und Verkehrsverhältnisse. Von F. Weiss. *Sketch-map and Diagrams.*

India—Benares. *G.Z.* **90** (1913): 77–96. **Mecking.**
Benares, ein kulturgeographisches Charakterbild. Von Ludwig Mecking. *Illustrations.*

India—Burma—Oil. *J.R.S. Arts* **61** (1913): 639–658. **Cholmeley.**
The oil-fields of Burma. By N. G. Cholmeley. *Illustrations.*

India—East Coast. *B. American G.S.* **45** (1913): 81–92. **Cushing.**
The East Coast of India. By Sumner W. Cushing. *Sketch-maps, Diagrams, and Illustrations.*

India—Himalayas. *Alpine J.* **27** (1913): 125–153. **Kellas.**
A fourth visit to the Sikkim Himalaya, with ascent of the Kanchenjhau. By A. Kellas. *Illustrations.*

India—Himalaya. *B. American G.S.* **44** (1912): 897–903. **Workman**
Survey of the Siachen glacier. By Fanny Bullock Workman.

India—Historical. *J. Bombay Br. R. Asiatic S.* **23** (1911–12): 217–238. **Rawlinson.**
Foreign influences in the civilization of Ancient India, 900 B.C.–400 A.D. By H. G. Rawlinson.

India—Kathiawar. *J.R.S. Arts* **61** (1913): 391–405. **Lee-Warner.**
Kathiawar. By Sir William Lee-Warner.

Indo-China—Shan States. *M. k.k. G. Ges. Wien* **55** (1912): 434–467. **Gebauer.**
Die nördlichen Schanstaaten und ihre Bewohner. Von Anton K. Gebauer. *Illustrations.*

Japan—Formosa. *M. k.k. G. Ges. Wien*, **55** (1912): 600–638. **Hofmann.**
Aus Formosa. Ergebnisse einer Studienreise im Jahre 1909. Von Dr. Amerigo Hofmann. *Illustrations.*

Japan—Formosa—Flora. **Hayata.**

Icones Plantarum Formosanarum nec non et Contributiones ad Floram Formosanam, or, Icones of the Plants of Formosa, and materials for a flora of the island, based on a study of the collections of the Botanical Survey of the Government of Formosa. By B. Hayata. Fasciculus ii., 1912. Published by the Bureau of Productive Industry. Taihoku, 1912. Size 10½ × 7½, pp. 236. *Illustrations.*

Japan—Miyako—Geology. **Yabe and Yehara.**

Sci. Reports, Tôhoku Imp. Univ. Sendai (2nd Ser.) **1** (1913): 11–23.

The cretaceous deposits of Miyako. By H. Yabe and S. Yehara. *Sketch-maps, Diagrams, and Illustrations.*

Japan—Sea-level. *B. Imp. Earthquake Investigation Com.* **5** (1913): 39–86. **Omori.**

On the recent sea-level variation at the different Japanese Mareograph stations. By F. Omori. *Sketch-map and Diagrams.*

See note in the July number, p. 76.

Malay Archipelago—Borneo. **Moulton and others.**

An expedition to Mount Batu Lawi, an hitherto unexplored mountain in Northern Sarawak. By J. C. Moulton. With appendices on some of the collections made, by H. N. Ridley, E. B. Copeland, J. J. Smith, Dr. A. Griffini, F. F. Laidlaw, and J. C. Moulton. (Extract from the *Journal* of the Straits Branch of the Royal Asiatic Society, No. 63, December, 1912.) Singapore. [London: William Wesley & Son], 1912. Size 10 × 6, pp. 106. *Map, Diagrams, and Illustrations.*

See note in vol. **38**, p. 530.

Malay Archipelago—Celebes. ——

Ts. Indische Taal-, Land- en Volkenkunde **54** (1912): 1–26.

Nota van toelichting over de berglandschappen boven het Paloedal.

Malay Archipelago—Celebes. ——

Ts. Indische Taal-, Land- en Volkenkunde **54** (1912): 27–57.

Nota betreffende het Landschap Toli-Toli. *Maps.*

Russia—Caspian sea. **Weber and Kalicki.**

Mém. Comité Géologique, N.S., Livr. **63** (1911): pp. 180.

Celeken. Von V. Weber und K. Kalickij. *Maps, Sections, and Illustrations.* [In Russian. German *résumé*.]

This island lies on the eastern side of the Caspian south of Krasnovodsk. The memoir treats of the surface features as well as the stratigraphy.

Russia—Caucasus. **Fischer, Platz, and Schuster.**

Z. Deuts.-Oesterr. Alpenvereins **43** (1912): 101–123.

Zwischen Terek und Ardon. Kaukasusfahrten im Sommer 1911. Von Dr. Walther Fischer, Ernst Platz und Oscar Schuster. *Illustrations.*

Russia—Caucasus—Geology. *B.A. Imp. Sc. St. Pétersbourg* (1913): 33–38. **Robinson.**

Nouvelles données sur la structure géologique du Caucase du Nord dans le bassin des fleuves Belaja et Laba. Por V. N. Robinson. [In Russian.]

Russia—Siberia. *B.A. Imp. Sc. St. Pétersbourg* (1913): 39–46. **Busch.**

Sur la division de la Sibérie en provinces phyto-géographiques. Par N. A. Busch. [In Russian.]

Russia—Siberia—Communications. **Rusakoff.**

Iz. Archangel S. Russian North (1911): 184–191, 341–348.

Economic importance of the northern sea route to Siberia. By V. A. Rusakoff. [In Russian.]

Russia—Siberia—Lake Baikal. **Stanilovski.**

Works East Siberian Section, Imp. Russ. G.S. No. **7** (1912): pp. 192.

Lake Baikal. (1. Physical Geography. 2. Description of the coast. 3. Flora and fauna. 4. Fish and fisheries. 5. Seals and seal industry. 6. Navigation on Lake Baikal. 7. Population on the coast. 8. Archæology. 9. Appendix.) By Anton Mikhailovich Stanilovski. [In Russian.]

Sea of Aral. **Hülsen and Sidorenko.**

M. Turkestanischen Abt. Kaiserl. Russischen G. Ges. **8** (1911): 1–50, 51–64.

Wissenschaftliche Ergebnisse der Aralsee-Expedition. Die Bodenproben des Aralsees. Von K. Hulsen. Petrographische Beschreibung der Bodenproben des Aralsees. Von M. Sidorenko. *Map and Illustrations.* [In Russian.]

Turkey—Syria. *La G., B.S.G. Paris* **27** (1913): 161–196. **Torcy.**
Notes sur la Syrie. Par Général de Torcy. *Map.*

AFRICA.

Africa—Ethnology. *B.G. Historique et Descriptive*, 1912: 75–216. **Avelot.**
Les grands mouvements de peuples en Afrique. Jaga et Zimba. Origines des nations Fundji, Shilluk, Galla, Masai, Kamba, Tshaga, Lunda, Koa, Malgache, Yaka, M'Bangala, Songo, M'Bundu, M'Kumbi, Kioko, Lovalé, Shinjé, Bémba, Rotsé. Par le Capitaine R. Avelot. *Sketch-map. Also separate copy, presented by the Author.*

Africa—Fauna. ———
Africa: Further correspondence relating to the preservation of wild animals in Africa. London: Wyman & Sons, 1913. Size 13 × 8½, pp. 56.

African islands. *Abh. k.k. G. Ges. Wien* **10** (1913): No. 2, pp. 77. **Baehr.**
Zur Landeskunde der Maskarenen. Von Dr. Alfred Baehr.

Algeria—Colonization. *B.S.G. Lille* **59** (1913): 20–59. **Morael.**
La colonisation française en Algérie. Par Georges Morael. *Illustrations.*

Algeria—Geology. *C.R.A. Sc. Paris* **156** (1913): 965–968. **Gentil.**
Sur la structure de la zone littorale de l'Algérie occidentale. Par Louis Gentil.

Angola—Bibliography. **Borchardt.**
Bibliographie de l'Angola (Bibliotheca Angolensis), 1500–1910. Par Paul Borchardt. N.P., N.D. Size 9 × 6, pp. 61.

British East Africa—Tana river. *United Umpire* **4** (1913): 331–335. **Ross.**
A journey down the Tana River, in the East Africa Protectorate. By W. McGregor Ross. *Illustrations.*

Cape Colony—Geology. **Department of Mines.**
Cape of Good Hope. Department of Mines. Sixteenth annual report of the Geological Commission, 1911. Cape Town, 1912. Size 9½ × 7½, pp. 136 and vi. *Maps and Sections.*

Cape Colony—Rainfall. *T.R.S. South Africa* **3** (1913): 41–46. **Stewart.**
The rainfall on Table Mountain. By Thomas Stewart.

Cape Colony—Tidal Phenomena. *T.R.S. South Africa* **3** (1913): 61–106. **Young.**
Tidal phenomena at inland boreholes near Cradock. By Andrew Young. *Plan, Diagrams, and Sections.*

Cape Verde islands. *B.S.G. Lisboa*, 1913: 49–89. **Da Costa e Andrade.**
Cabo Verde, por Alfredo da Costa e Andrade.

Central Africa—Fish-fauna. **Steindachner.**
Sitzb. K.A.W., Mathemat. Naturwissens. Kl. **120** (1911): 1171–1186.
Beiträge zur Kenntnis der Fischfauna des Tanganyikasees und des Kongogebietes. Von Dr. Franz Steindachner. *Illustrations.*

East Africa—Morphology. **Staff.**
Verh. 18. *Deutschen Geographentages Innsbruck* (1912): 73–81.
Morphologische Ergebnisse der Deutschen Tendaguru-Expedition in Ost-Africa 1911. Von Hans von Staff.

Egypt—Eastern Desert. **Ball.**
Egypt: Survey Department. The geography and geology of South-Eastern Egypt. By John Ball. Cairo, 1912. Size 10½ × 7½, pp. xii. and 394. *Maps and Illustrations.*
See review, *ante*, p. 284.

Egypt—Historical. *B.G. Historique et Descriptive*, 1912: 246–267. **Beaugé.**
Notes Historiques sur l'Égypte. Damiette et Mansourah. Par Charles Beaugé.

Egypt—Nile. **Pasim.**
Ministry of Finance, Egypt. Survey Department. Nile gauge at Roda (Cairo). Register of daily readings from August 16, 1872, to December 31, 1911. Computed by Mohammad Kasim. Cairo, 1912. Size 13 × 9½, pp. xvi. and 30. *Plan and Diagrams.*

Egypt—Sinai. *National G. Mag.* **23** (1912): 1242–1282. **Prentice.**
Sunrise and sunset from Mount Sinai. By Rev. Sartell Prentice. *Sketch-map and Illustrations.*

Egypt—Sinai. *Cairo Scientific J.* **7** (1913): 24–31. **Sheridan.**
The Desert Waters of Northern Sinai. By Harold Sheridan. *Plates.*

Egypt—Survey. **Survey Department.**
Ministry of Finance, Egypt. Survey Department. Report on the work of the Survey Department in 1911. Cairo, 1913. Size 10½ × 7, pp. 76.

Eritrea—Communication. *Riv. Col.* **7** (1912): 65–75. **Checchi.**
La ferrovia Massaua-Asmara. Per Michele Checchi. *Illustrations.*

French Sudan—Wadai. *La G., B.S.G. Paris* **27** (1913): 33–40. **Arnaud**
Aperçu géographique et géologique de la région ouaddaïenne (1910–1911). Par Capitaine Arnaud. *Map.*

French West Africa. **Chevalier.**
Nouvelles Archives Missions Sc. et Littéraires . . N.S. **5** (1912): pp. 131.
Rapport sur une Mission Scientifique dans l'Ouest Africain (1908–1910), par Auguste Chevalier. *Maps.*

Rhodesia—Victoria Falls. **Heath and Clark.**
Victoria Falls. An album. By the Rev. Alban Heath and Percy M. Clark. London, [1913]. Size 9 × 6, pp. 78. *Illustrations.*

Sahara. *Norske G. Selskaps Aarbok* **23** (1913): 51–76. **Holmsen.**
Litt fra en studiereise i Sahara. Av cand. real Gunnar Holmsen. *Illustrations.*

South Africa—Water-supply. *Deutsches Kolonialblatt* **24** (1913): 110–118. ———
Die Bohrtätigkeit in Deutsch-Südwest- und Britisch-Südafrika.

Tripoli. **Ghisleri.**
Primi studi agrologici sulla zona di Tripoli. Per A. Ghisleri. (Estratto dall' *Emporium*, vol. **37**, N. 218, Febraio 1913.) N.P. (1913). Size 10 × 7½, pp. 119–139. *Presented by the Author.*

NORTH AMERICA.

Alaska—Geology. *U.S. Geol. Surv. B.* **502** (1912): pp. 60. **Kinopf.**
The Eagle River Region, South-eastern Alaska. By Adolph Knopf. *Maps, Sections, and Illustrations.*
The region in question includes the Juneau gold belt.

Alaska—Mount McKinley. *Alpine J.* **27** (1913): 189–195. **Parker.**
Conquering Mount McKinley: The Parker-Browne expedition of 1912. By Herschel C. Parker. *Illustrations.*
See note in the Monthly Record, p. 197.

Alaska—Tanana Basin. *U.S. Geol. Surv. B.* **501** (1912): pp. 64. **Capps.**
The Bonnifield region, Alaska. By Stephen R. Capps. *Maps, Sections, and Illustrations.*
This region lies south of the middle course of the Tanana.

Canada—British Columbia—Bulkley river. **Morice.**
B.S. Neuchâteloise G. **21** (1911–12): 101–126.
Exploration de la rivière Bulkley. (Colombie Britannique.) Par le Rev. Père A. G. Morice. *Map.*

Canada—Cities. *J. Geography* **11** (1913): 256–260. **Brittain.**
Geographical influence in the location of leading Canadian cities. By Isabel G. Brittain.

Canada—Clay belt. *J. Geography* **11** (1913): 250–255. **Dresser.**
The clay belt of Northern Ontario and Quebec. By John A. Dresser. *Sketch-map and Illustrations.*

Canada—New Brunswick. **Ganong.**
B. Nat. Hist. S. New Brunswick **6** (1913): 419–451.
Notes on the natural history and physiography of New Brunswick, 124-127. *Sketch-maps and Diagram.*
The longest papers deal with river physiography.

Canada—Ontario. **Wilson.**

Canada. Department of Mines. Geological Survey. Memoir No. 17 E. Geology and economic resources of the Larder Lake District, Ont., and adjoining portions of Pontiac County, Quebec. By Morley E. Wilson. Ottawa, 1912. Size 10 × 6½, pp. viii. and 62. *Maps, Illustrations, and Sections.*

Canada—Quebec. **Dresser.**

Canada. Department of Mines. Geological Survey. Memoir No. 35. Reconnaissance along the National Transcontinental Railway in Southern Quebec. By John A. Dresser. Ottawa, 1912. Size 10 × 6½, pp. viii. and 42. *Maps and Illustrations.*

Canada—Selkirks. **Palmer.**

To the apex of the Selkirks. By Howard Palmer. (Extract from "Outing," May, 1913.) New York, 1913. Size 10 × 7, pp. 144–158. *Illustrations.*

Mexico—Climatology. *B. American G.S.* **45** (1913): 1–12, 107–116. **Huntington.**

The shifting of climate zones as illustrated in Mexico. By Ellsworth Huntington.

See note in the June number, p. 588.

North America—Anthropology. *B. American G.S.* **45** (1913): 161–180. **Jefferson.**

The anthropography of North America. By Mark Jefferson. *Sketch-maps.*

North America—Geology. **Willis.**

U.S. Geol. Surv. Professional paper **71** (1912): pp. 894.

Index to the stratigraphy of North America. By Bailey Willis. *Sketch-maps. Geological Map in separate case.*

United States. *Science* **37** (1913): 210–213. **Brigham.**

The Transcontinental excursion of the American Geographical Society.

United States—Census. **Census Bureau.**

Department of Commerce and Labor. Bureau of the Census. Thirteenth Census of the United States, taken in the year 1910. Abstract of the Census. Statistics of Population, Agriculture, Manufactures, and Mining for the United States, the States, and principal cities. Washington, 1913. Size 12 × 9, pp. 570. *Sketch-maps and Diagrams.*

United States—Climate. *B. American G.S.* **45** (1913): 117–131. **Arctowski.**

On some climatic changes recorded in New York City. By Henryk Arctowski. *Diagrams.*

Noticed in the August number, p. 198.

United States—Colorado—Coal. *U.S. Geol. Surv. B.* **510** (1912): pp. 238. **Lee.**

Coalfields of Grand Mesa and the West Elk Mountains, Colorado. By Willis T. Lee. *Map, Sections, Diagrams, and Illustrations.*

United States—Kansas. *B.G.S. Philadelphia* **11** (1913): 103–112. **Emerson.**

Some Geographic responses in South Central Kansas. By F. V. Emerson. *Sketch-map, Section, and Diagrams.*

United States—Lighthouses. *National G. Mag.* **24** (1913): 1–53. **Putnam.**

Beacons of the Sea. Lighting the Coasts of the United States. By George R. Putnam. *Illustrations.*

United States—Mississippi. *J.G.* **11** (1913): 184–187. **Chandler.**

Harnessing the Father of Waters. By Harley P. Chandler. *Illustrations.*

See note in the April number, p. 389.

United States—Pennsylvania. *Popular Sc. Monthly* **82** (1912): 280–288. **Andrews.**

The Sweden valley ice mine and its explanation. By M. O. Andrews. *Section and Illustrations.*

See note in the August number, p. 203. A reference may be added to the work by the Rev. G. F. Browne (now Bishop of Bristol) on 'Ice-caves in France and Switzerland' (Longmans, 1865).

United States—Snowfall. *Quarterly J.R. Met. S.* **39** (1913): 81–86. **Brooks.**

The snowfall of the United States. By Charles F. Brooks. *Sketch-map.*

See note in the July number, p. 78.

CENTRAL AND SOUTH AMERICA.

Argentina—Swiss Colonies. **Schuster.**

Jber. G.-Ethnogr. Ges. Zürich, 1911–1912 (1912): 97–196.

Heimatklänge vom Silberstrom. Historisch-geographische Skizze über die Schweizerkolonien in Argentinien. Von Adolf N. Schuster.

Bolivia—Language. **Créqui-Montfort and Rivet.**

La Famille Linguistique Capakwa, par G. de Créqui-Montfort et P. Rivet. (Extrait du *Journal de la Société des Américanistes de Paris*, Nouvelle série, tome x., 1913, pp. 119–171.) [Paris], 1913. Size 11 × 7, pp. 119–171. *Sketch-map.*

Brazil—Communications, etc. **Gonçalves.**

Ministerio da Viaçao e Obras Publicas. Relatorio apresentado ao Presidente da Republica dos Estados Unidos do Brazil. Pelo Dr. José Barboza Gonçalves. Rio de Janeiro, 1912. Size 9½ × 6½, pp. viii. and 582. *Diagrams. Presented by the Minister of Works.*

Brazil—São Paulo. **Comissão Geographica.**

Commissão geographica e geologica do Estado de S. Paulo. Exploração do Rio Grande e de seus affluentes. (João P. Cardoso, Chefe da Commissão.) São Paulo, 1913. Size 18 × 13, pp. 44. *Maps and Illustrations.*

Chile—Borax. *J. Geology* **20** (1913): 763–768. **Chamberlin.**

The physical setting of the Chilean Borate deposits. By Rollin T. Chamberlin. *Illustrations.*

Chile—Patagonia. **Steffen.**

Die Landbrücke von Ofqui in Westpatagonien. Von Prof. Dr. Hans Steffen. (Sonderabdruck aus den Mitteilungen der Geographischen Gesellschaft in Jena, Bd. 31.) Jena, 1913. Size 9 × 5½, pp. 19–64. *Map, Sections, and Illustrations.*

A study of the lowlying isthmus joining the Taitao peninsula to the mainland, and its relation to the glaciers of the neighbouring Cordillera.

Colombia—Language. **Aramas.**

Contribución al Estudio de la Lengua Guajira. Por R. Oramas. (Publicaciones de la *Revista Technica del Ministerio de Obras Publicas* de los EE. UU. de Venezuela.) Caracas, 1913. Size 8 × 5, pp. 84.

Guatemala—Quirigua. *National G. Mag.* **24** (1913): 339–361. **Morley.**

Excavations at Quirigua, Guatemala. By Sylvanus Griswold Morley. *Plan and Illustrations.*

Salvador. **Rodrigues.**

Estudio Geografico, Histórico, Etnográfico, Filológico y Arqueológico de la República de el Salvador en Centro-América. Por Doctor Leopoldo Alejandro Rodrigues. Mexico, 1912. Size 9 × 6, pp. 173.

South America—Geology. **Woodworth.**

B. Museum Comparative Zool. Harvard College, Geol. Ser. **10** (1912): No. I. pp. 138.

Geological expedition to Brazil and Chile, 1808–1909. By J. B. Woodworth. *Sketch-maps, Sections, and Illustrations.*

West Indies—Cuba. *B.S.R. Belge G.* **36** (1912): 317–348. **Zayas y Alphonso.**

L'île de Cuba: étude de géographie économique. Par Dr. Zayas y Alphonso.

AUSTRALASIA AND PACIFIC ISLANDS.

Cook and Society Islands. **Marshall.**

Rept. Australasian Ass. **13**, 1911 (1912): 140–145.

Coral reefs of the Cook and Society Islands. By Prof. P. Marshall. *Illustrations and Sections.*

Hawaii—Kilauea. *American J. Sc.* **35** (1913): 337–349. **Perret.**

The circulatory system in the Halemaumau lava lake during the summer of 1911. By Frank A. Perret. *Plan, Section, and Illustrations.*

Hawaii—Kilauea. *American J. Sc.* **35** (1913): 273–282. **Perret.**

The floating islands of Halemaumau. By Frank A. Perret. *Illustrations.*

See note in the August number, p. 202.

Hawaii—Kilauea. *American J. Sc.* **35** (1913): 139–148. **Perret.**
The lava fountains of Kilauea. By Frank A. Perret. *Illustrations.*

Hawaii—Kilauea. *American J. Sc.* **35** (1913): 469–476. **Perret.**
Subsidence Phenomena at Kilauea in the summer of 1911. By Frank A. Perret. *Diagram and Illustrations.*

Hawaii—Vulcanism. *B. Seismological S. America* **3** (1913): 14–19. **Wood.**
The Hawaiian Volcano Observatory. By Harold O. Wood.

Marshall Islands—Naurau. *Z. Ges. E. Berlin*, 1912: 671–681. **Hambruch.**
Entstehung, Bildung und Lagerung des Phosphats auf Naurau. (Verwaltungsbezirk der deutschen Marshallgruppe.) Von Dr. Paul Hambruch.

New Guinea, Dutch. *Ts. k. Ned. Aardr. Genoots.* **30** (1913): 345–356. ———
De exploratie von Nieuw-Guinea.
On the work of detachments under Ten Klooster, Herderschee, and others.

New Guinea, German. *M. Deuts. Schutzgeb.* **26** (1913): 126. **Moisel.**
Begleitworte zu den vorläufigen Karte des Kaiserin-Augusta-Flusses. Von M. Moisel. *Map.*

New Zealand—Census. ———
New Zealand, 1912. Results of a Census of the Dominion of New Zealand taken for the night of the 2nd April, 1911. Wellington, 1912. Size 13 × 8½, pp. xvi., 508, and cvi.

New Zealand—Geology. *Rept. Australasian Ass.* **13**, 1911 (1912): 212–216. **Speight.**
Report on the structural features of New Zealand. By R. Speight.

New Zealand—Hauraki—Geology. **Bell and Fraser.**
New Zealand Geol. Surv. B. **15** (1912): pp. viii. and 192.
The geology of the Waihi-Tairua subdivision, Hauraki Division. By James Mackintosh Bell and Colin Fraser. *Maps, Illustrations and Sections.*

POLAR REGIONS.

Antarctic—Historical. *Norske G.S. Aarbok* **22** (1910–11): 1–120. **Skattum.**
Sydpolforskning. En utsigt over dens utvikling gjennem tiderne. Av O. J. Skattum. *Portraits and Illustrations.*

Arctic—Eskimo. *National G. Mag.* **23** (1912): 1225–1238. **Greely.**
The origin of Stefanssons blond Eskimo. By Major-General A. W. Greely. *Sketch-map and Illustrations. Also separate copy*, size 10 × 7.

Arctic—Victoria Land. *B. American G.S.* **45** (1913): 93–107. **Stefánsson.**
Victoria Island and the surrounding seas. By Vilhjálmur Stefánsson. *Sketch-map.*

Novaya Zemlya. *M. Archangel S. Russian North* **12** (1911): 117–123, 435–443. **Buikoff.**
Beyond the Arctic circle. By A. Buikoff. *Illustrations.* [In Russian.]

Polar Regions—Deserts. *Norske G. Selskaps Aarbok* **23** (1913): 77–82. **Holmsen.**
Ørkendannelse i polarlandene. Av cand. real Gunnar Holmsen. *Illustration.*

Spitsbergen. *Norske G.S. Aarbok* **22** (1910–11): 121–138. **Holtedahl**
Gjennem ukjendte strök av Spitsbergens indland. En slaedetur Kingsbay—Woodbay—Ekmanbay paa den norske Spitsbergenekspedition sommeren 1911. Av Olaf Holtedahl. *Illustrations.*
See note on this expedition in vol. **39**, p. 162.

Spitsbergen. **Meinardus.**
Sitzb. Naturhistorischen V. preuss. Rheinlande und Westfalens, 1912 (1913): C. 1–42.
Ueber einige charakteristische Bodenformen auf Spitzbergen. Von Wilhelm Meinardus. *Illustrations.*

Spitsbergen—Mount Lusitania. *B.S. Neuchâteloise G.* **21**: (1911–12): 5–77. **Dubois.**
La région du Mont Lusitania au Spitzberg. Par Auguste Dubois. *Map and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Altitudes. *M.V.E. Dresden* **2** (1910): 1–59. **Hugershoff.**
Die periodischen Fehler barometrisch bestimmter Höhenunterschiede in den inneren Tropenzone. Von Dr. Hugershoff. *Illustrations.*

Cartography. **Service Géographique (France).**
Service Géographique de l'Armée. Rapport sur les travaux exécutés en 1911. Paris, 1912. Size 10 × 6½, pp. 64. *Maps and Diagrams.*

Cartography—Method. **Gehne.**
M. Sächsisch-Thüringischen V.E. Halle a. S. **36** (1912): 1–8.
Geomorphologische Karte der Umgebung von Thale, nach einer neuen Methode auf Grund eigener Begehungen dargestellt von Dr. Hans Gehne. *Map.*

Geodesy—Base-measurement. *M. k.k. Militär-G.I.* **31** (1911): 63–102. **Gaksch.**
Invardrahtmessungen des k. und k. Militär-geographischen Institutes. Von Karl Gaksch. *Illustrations.*

Longitudes. *M. Deuts. Schutzgeb.* **26** (1913): 1–9. **Kohlschütter and Ambronn.**
Die Methode absoluter Längenbestimmungen durch relative Mondzenitdistanzen im Vergleich mit der Methode der Mondkulmination. Von Dr. E. Kohlschütter.
Bemerkungen zu den vorstehenden Aufsatze. Von Prof. Dr. Ambronn.

Navigation—Charts. *C.R.A. Sc. Paris* **156** (1913): 445–450. **Gernez.**
Tracé et usage des cartes pour la navigation orthodromique construites sur les plans tangents aux pôles. Par M. Gernez. *Diagrams.*

Time Signals. *C.R.A. Sc. Paris* **156** (1913): 454–456. **Turpain.**
L'inscription des signaux hertziens de l'heure. Possibilité d'inscrire directement et de déterminer sans calcul et au centième de seconde près l'heure envoyée par la Tour Eiffel. Par Albert Turpain. *Diagrams.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Biogeography. **Lohmann.**
Untersuchungen über das Pflanzen- und Tierleben der Hochsee, zugleich ein Bericht über die biologischen Arbeiten auf der Fahrt der "Deutschland" von Bremerhaven nach Buenos Aires in der Zeit vom 7. Mai bis 7. September 1911. Von H. Lohmann. (Veröffentlichungen des Instituts für Meereskunde an der Universität Berlin. N. F., A. Geographisch-naturwissenschaftliche Reihe, Heft IV.) Berlin, 1912. Size 10½ × 7, pp. 92. *Map and Diagrams.*

Climatology—Forest influences. *Popular Sc. Monthly* **82** (1913): 313–331. **Ward.**
The influence of forest upon climate. By Prof. Robert De C. Ward.

Coral Reefs. *American J. Sc.* **35** (1913): 173–188. **Davis.**
Dana's confirmation of Darwin's theory of Coral Reefs. By [Prof.] W. M. Davis. *Section.*

Dust-falls. *Sitz. K.A.W. Berlin*, 1913: 272–282. **Hellmann.**
Ueber die Herkunft der Staubfälle im "Dunkelmeer." Von G. Hellmann.

Erosion. *Popular Sc. Monthly* **82** (1913): 468–477. **Keyes.**
Great erosional work of winds. By Dr. Charles R. Keyes. *Illustrations.*

Geology—Rock-magmas. *South African J. Sc.* **9** (1913): 186–192. **Schwarz.**
Laccolites and Bysmalites. By Prof. Ernest H. L. Schwarz.

Geology—Salt. *Popular Sc. Monthly* **82** (1913): 187–191. **Harris.**
Immense salt concretions. By Prof. G. D. Harris.

Geological History. **Geer.**
A geochronology of the last 2000 years. By Gerard De Geer. (Extrait du Compte Rendu du XI^e^ Congrès Géologique International, 1910.) Stockholm, 1912. Size 9½ × 6½, pp. 241–254. *Sketch-map and Sections.*

Geomorphology. *B. American G.S.* **45** (1913): 281–284. **Hobbs.**
Soil Flow. By William Herbert Hobbs.

Geomorphology—Atlas. **Passarge.**
Verh. 18. *Deutschen Geographentages Innsbruck*, 1912: 236–247.
Ueber die Herausgabe eines physiologisch-morphologischen Atlas. Von Prof. Dr. S. Passarge.

Geomorphology and Climate. *Sitzb. K.A.W. Berlin*, 1913: 77–97. **Penck.**
Die Formen der Landöberfläche und Verschiebungen der Klimagürtel. Von A. Penck.

Geomorphology—Gorges. *J.G.* **11** (1913): 209–215. **Davis.**
The Rhine gorge and the Bosphorus. By W. M. Davis.

Geomorphology—Peneplains. *G.Z.* **90** (1913): 185–202. **Hettner.**
Rumpfflächen und Pseudorumpfflächen. Von Alfred Hettner.

Geophysics. *Geol. Mag.*, Dec. V. **10** (1913): 250–252. **Fisher.**
On the rigidity of the Earth, and on Colonel Burrard's theory of the Himalayas. By the Rev. O. Fisher.

Geophysics. *C.R.A. Sc. Paris* **156** (1913): 363–366. **Kovesligethy.**
Sur l'étude de la constitution du Globe, au moyen des rayons sismiques. Par R. de Kovesligethy.

Land hemisphere. *C.R.A. Sc. Paris* **156** (1913): 1714–1716. **Berget.**
Sur la position exacte der pôle continental de la terre. Par Alphonse Berget.

Limnology. **Wesenberg-Lund.**
Internationale Rev. Hydrobiologie und Hydrographie **5** (1912): 287–316.
Ueber einige eigentümliche Temperaturverhältnisse in der Litoralregion der baltischen Seen und deren Bedeutung, nebst einem Anhang über die geographische Verbreitung der zwei Geschlechter von *Stratiotes aloides*. Von C. Wesenberg-Lund. *Illustrations.*

Limnology—Seiche. *Beiträge z. Geophysik* **12** (1912): Kleine M., 1–8. **Halbfass.**
Die thermische Seiche. Von Prof. Dr. W. Halbfass. *Diagrams.*

Oceanic Deposits. **Vérain and Chevallier.**
B.I. Océanogr. Monaco, No. 255 (1913): pp. 22.
Emploi de l'électro-aimant dans l'analyse microminéralogique des fonds sous-marins. Par L. Vérain et A. Chevallier. *Illustrations and Diagrams.*

Oceanic Relief. **Groll.**
Veröff. I. Meereskunde, Berlin; Neue Folge, A, Heft 2 (1912): pp. 92.
Tiefenkarten der Ozeane; mit Erlauterungen. Von Dr. Max Groll. *Maps.*

Oceanography—Currents. *Zap. Hydrography* **34** (1912): 1–52. **Spindler.**
On the question of marine currents. By I. Spindler. *Sketch-maps, Sections, and Illustrations.* [In Russian.]

Phytogeography. *Fennia* **28** (1909–10): 1–175. **Cajander.**
Ueber Waldtypen. Von A. K. Cajander.

Terrestrial magnetism. *Zap. Hydrography* **33** (1911): 1–122. **Bulganoff.**
Gauss's theory of terrestrial magnetism and its present importance for science. By N. Bulganoff. [In Russian.]

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. *Ann. de G.* **22** (1913): 1–40. **Brunhes.**
Du caractère propre et du caractère complex des faits de géographie humaine. Par Jean Brunhes.

Anthropogeography—Population. **Maurer and Weise.**
Petermanns M. 59 (1913) I.: 229–232.
Zum Auerbachschen Gesetz der Bevölkerungskonzentration. Von Prof. Dr. Hans Maurer und Dr. Ludwig Weise.

Commercial Geography. *B.G.S. Philadelphia* **11** (1913): 113–120. **Smith.**
The North Atlantic trade route. By Prof. J. Russell Smith.

Economic—Fisheries. *G.Z.* **90** (1913): 136–153, 202–213. **Oppel.**
Die Fischerei. Von Prof. Dr. A. Oppel.

Historical—Eratosthenes. **Von Scala.**
Verh. 18. Deutschen Geographentages Innsbruck, 1912: 206–217.
Das Fortleben der eratosthenischen Masse. Von Prof. von Scala.

Historical—Exploration. *Nineteenth Century and After* **434** (1913): 749–772. **Lee.**
Arctic Exploration in Shakespeare's Era. By Sir Sidney Lee.

Historical—Pytheas. *B.R.S.G. Madrid* **55** (1913): 61–100. **Blazquez.**
Pyteas de Marsella. Por D. Antonio Blázquez. *Map.*

Historical— Thule. *Scottish G. Mag.* **29** (1913): 196–197. **Horsburgh.**
The Thule of Tacitus. By E. M. Horsburgh.

BIOGRAPHY.

Björnbo. *Norske G.S. Aarbok* **22** (1910–1911): 109–145. **Vangensten.**
Axel Anton Björnbo. Av Ove C. L. Vangensten. *Portrait.*
Dr. Björnbo was known for his studies of the early cartography and geography of Northern Europe (cf. *Journal*, vol. **36**, p. 686). He died in 1911.

Forel. **Zschokke.**
Internationale Rev. Hydrobiologie und Hydrographie **5** (1912): 227–233.
F. A. Forel. Worte des Gedenkens. Von F. Zschokke. *Portrait.*

Geikie. *Geological Mag.*, Dec V. **10** (1913): 241–248. ——
Eminent living Geologists. James Geikie, LL.D. *Portrait.*

Toll. *Petermanns M.* **59** (1913) I.: 257. ——
Gedenktafel für Baron Eduard Toll. *Illustration.*

Vahsel. *Petermanns M.* **59** (1913): I. 225–226. **Drygalski and Kramer.**
Richard Vahsel. Von Erich von Drygalski und Augustin Krämer. *Portrait.*
Vahsel was the captain of the German Antarctic ship *Deutschland* (*Journal*, vol. **41**, p. 358), having previously taken part in the first German Antarctic expedition, and commanded the *Peiho* in the Hamburg South Sea expedition of 1908–10.

GENERAL.

Bibliography. **Baschin.**
Bibliotheca Geographica . . . Herausgegeben von der Gesellschaft für Erdkunde zu Berlin. Bearbeitet von Otto Baschin. Band xvii., Jahrgang 1908. Berlin: W. H. Kuhl, 1912. Size 9½ × 6, pp. xvi. and 532.

British Empire—Wool. *J.R.S. Arts* **61** (1913): 327–347. **Bean.**
The wool industry in the British Dominions. By C. E. W. Bean.

Commercial—Trade routes. **Smith.**
The World carriers and the Panama Canal. By J. Russell Smith.
See note in the August number, p. 204.

Education. *G.Z.* **90** (1913): 65–77. **Penck.**
Der Geographie-Unterricht auf höheren Schulen. Von Albrecht Penck.

Education—Apparatus. *Science* **37** (1913): 803–806. **Compton.**
A laboratory method of demonstrating the Earth's rotation. By Arthur H. Compton. *Illustration and Diagram.*

German Alpine Museum. *Z. deuts. Oesterr. Alpenvereins* **43** (1912): 1–24. **Müller.**
Das Alpine Museum. Von Karl Müller. *Illustrations and Diagram.*

German Colonies. ——
Die deutschen Schutzgebiete in Afrika und der Südsee, 1911–1912. Amtliche Jahresberichte herausgegeben vom Reichskolonialamt. Berlin, 1913. Size 10½ × 7, pp. xvii. and 370.

Humboldt Society. **Wagner.**
Verh. 18. *Deutschen Geographentages Innsbruck*, 1912: 231–235.
Ueber den Plan zur Begründung einer "Humboldt-Gesellschaft" für Geschichte der Geographie und Kartographie. Von Prof. Dr. Hermann Wagner.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

British Isles—England and Wales. **Ordnance Survey.**
Sheets published by the Director-General of the Ordnance Survey from July 1 to 31, 1913.

1-inch map :—

England and Wales. 3rd edition. Engraved in outline. Sheets 59, 68, 74, 85. *Price* 1*s.*

Large-sheet series, printed in colours, and folded in covers or flat in sheets. **Harrogate,** 26 sheets. *Price, on paper,* 1*s.* 6*d.*; *mounted on linen,* 2*s.*; *mounted in sections,* 2*s.* 6*d.*

6-inch maps :—

Revised quarter-sheets, with contours in blue and red. *Price* 1*s. each.*

Berkshire, 14 N.W., N.E., 15 N.W., 17 S.W., 19 N.W., S.W., 20 S.E., 21 S.E., 24 S.E., 25 N.E., 34 N.W., N.E., 35 N.E., S.W., S.E., 36 S.W., 39 N.W., S.W., 42 N.E., 45 N.E. (47 N.E. and 47 S.E.). **Cheshire,** 6 S.E., 12 N.W., N.E., S.W., N.E., 11 N.W., 21 N.E., 22 S.E., 30 S.E., 38 S.W., 46 N.W., 60 N.W., 61 S.W. **Lancashire,** 52 N.W., 63 N.E., 65 N.W. **Sussex,** 3 S.W., 10 N.E., 11 S.W., 24 N.W., 25 S.W., S.E., 27 S.W., S.E., 30 N.E., 31 N.W., S.E. **Yorkshire,** 91 N.W., N.E., 103 N.W., 108 N.W., 110 S.E., 157 N.E.

1 : 2500 scale :—

Denbighshire, 4, 3, 6-1, 2, 3, 5, 6, 7, 9, 11, 13, 14, 15. **Lancashire,** 15–15, 16-12, 17–6, 10, 14, 24-12, 16, 25–6, 8, 9, 10, 11, 12, 14, 26–5, 10, 13, 14, 31–2, 32–1, 2. **Middlesex,** 20–9, 24–16. **Norfolk,** 64–6, 10, 14, 75–5, 6, 7, 8, 76–2, 5. **Oxfordshire,** 53–2, 4, 11, 12, 56–3, 4. **Surrey,** 2–13, 7–11, 18–8, 19–5, 9. **Yorkshire,** 53–4, 12, 16, 69–1, 2, 3, 4, 7, 8, 9, 70–1, 6, 7, 8, 10, 11, 12, 14, 13, 71–9, 14.

E Stanford, London Agent.

British Isles—London. **Ogilby and Ordish.**

Roads out of London, being photographic reprints extracted from Ogilby's 'Britannia,' 1675, with so much of his text as relates to them. Edited by T. Fairman Ordish, F.S.A. London: The London Topographical Society, 1911.

This is another of the interesting facsimile reproductions issued by the London Topographical Society. It consists of five plates, each showing three of the principal roads for an average distance of 8 miles from the starting-point, the "Standard" Cornhill, preceded by Ogilvie's description of the parts of the roads concerned. The plates are good collotype reproductions by Emery Walker, Ltd.

Central Europe. **K. u. K. Militärgeographisches Institut.**

Generalkarte von Mitteleuropa. Scale 1 : 200,000 or 1 inch to 3·2 stat. miles. Sheets: 39° 43°, Priština; 40° 44°, Zaječar; 41° 42° Džumaja. Vienna, K. u. K. Militärgeographisches Institut, 1912–1913. *Price* 1.20*m. each sheet.*

Switzerland. **Federal Department of the Interior.**

Karte mit Darstellung der besonderen Bestimmungen über den Automobilverkehr in der Schweiz im Massstab 1 : 500,000 (1 inch to 7·9 stat. miles). Herausgegeben vom Eidg. Departement des Innern. Bern: Schweizerischen Landestopographie, 1913. *Price* 2 *fr.*

An outline map of Switzerland showing roads over which a motor car can be freely driven, restricted motor roads and roads over which it is forbidden to drive motor cars. In addition to this information, by means of symbols localities with special limitations are indicated, as are also custom offices for the control of motor cars, so that altogether this map cannot fail to be of interest and importance to motorists travelling in the country. It is folded for the pocket and accompanied by text giving general directions concerning motor car traffic in Switzerland.

ASIA.

Asia. **Bacon.**

Bacon's Excelsior School Map of the near and middle East. Contour Edition. Scale 1 : 6,019,200 or 1 inch to 95·6 stat. miles. London; G. W. Bacon & Co. Ltd., [1913]. *Price* 7*s.* 6*d. Presented by the Publishers.*

A school wall map measuring 32 by 42 inches, and extending from the Black and Caspian Seas to the Gulf of Aden, and from Italy to the Indus. Land relief is shown on the layer system in tints of green, buff, and red, and depths of water by different shades of blue. An inset of Palestine on an enlarged scale appears in the left-hand lower corner. A selection of more important ancient and modern place-names is given.

Asia Minor. **Philippson.**

Topographische Karte des westlichen Kleinasien nach eigenen Aufnahmen auf Reisen, die mit Mitteln des Kais. Deutschen Archäologischen Instituts im Jahre 1900, der Hermann und Elise Geb. Hickmann Wentzel Stiftung in den Jahren

1901, 1902, und 1904 ausgeführt sind entworfen von Dr. Alfred Philippson. Scale 1 : 300,000 or 1 inch to 4·7 stat. miles. Dritte Lieferung (Blatt 5 und 6). Gotha : Justus Perthes, 1913. *Price* 8 *Marks each part. Presented by the Publisher.*

The publication of this part brings this important map, which was commenced in 1910, to completion. The area included is that part of Asia Minor, with the adjacent islands, lying to the west of 30° 20′, and the whole map consists of six sheets, each measuring 25 by 27 inches. Although specially prepared by Dr. A. Philippson to exhibit the results of the explorations mentioned in the title, it is by no means confined to the work done by these expeditions. Previous cartographical material has been carefully dealt with and utilized, so that the result is an excellent general map of the region embraced. Great attention has been given to the identification of ancient sites and names, which are printed in red. This third part of the map contains the two southern sheets, with the islands of Rhodes, Kos, and adjacent coast district.

India. **Surveyor-General of India.**

Maps published by the Survey of India during the quarter ending March 31, 1913. Provincial Maps: Bihar and Orissa, scale 1 inch to 16 miles; Bengal, Bihar and Orissa, scale 1 inch to 32 miles; Punjab, scale 1 inch to 80 miles. Miscellaneous maps: Delhi, scale 4 inches to 1 mile; Delhi and vicinity, scale 4 inches to 1 mile, 4 sheets. Ali Rajpur State, scale 1 inch to 4 miles; Jhabua State, scale 1 inch to 4 miles. India and adjacent countries, scale 1 : 1,000,000, sheets: (Provisional Issue) 45, 77. Degree Sheets, scale 1 inch to 4 miles. Afghanistan and North-West Frontier Province, sheet 38 K; Bihar and Orissa, sheets (Provisional Issue) 73 E, 73 H, 73 K; Bihar and Orissa and Bengal, sheet (Provisional Issue) 73 J; Bihar and Orissa and Central Provinces, sheet (Provisional Issue) 73 B; Burma and Siam, sheet 94 F; North-West Frontier Provinces, sheet 38 L; Punjab and North-West Frontier Province, sheet 38 O. Standard sheets, scale 1 inch to 1 mile; Assam 78–O 4, 78–O 15; Bengal and Bihar and Orissa, sheet 78–B 2 (preliminary edition); Bihar and Orissa, sheets (preliminary edition) 71–G 2, 72–G 6, 72–O 8; Burma, sheets 92–H 4, 92–H 10, 92–H 11 with part of H 15, 92–H 12, 92–L 8, 93–E 2, 93–E 6 (Provisional Issue) 93–I 13, 93–J 12; 93–K 9 and 13 (506) 2nd edition, 93–N 4, 94–C 11 and 15 (307) 3rd edition, 94–E 15, 94–E 16, 94–F 9 and 13, 94–I 1, 94–I 2; Central India and Central Provinces, sheets 55–I 15, 55–I 16, 55–J 1, 55–J 5; Central Provinces, 55–I 9, 55–I 13, 55–I 14, 55–M 4, 55–M 6, 55–M 7, 55–M 8, 55–M 10, 55–M 11, 55–M 12, 55–M 14, 55–N 9; Madras, sheets 48–K 10, 48–K 11, 48–K 12, 58–A 12, 58–B 7, 58–B 10; Punjab, sheets 39–M 9, 39–M 13, 39–M 14. 43–D 11, 43–D 14, 43–D 15, 43–H 3, 43–H 4, 43–H 8, 44–A 1, 44–A 2, 44–A 4, 44–A 12, 44–E 1, 44–E 3, 44–E 9, 44 E 13, 44–E 14, 44–E 15; United Provinces, sheets 54–N 5 54–N 7, 54–N 10, 54–N 13, 54–N 14, 63–B 1, 63–B 2, 63–B 3, 63–B 5, 63–B 6, 63–B 7, 63–B 9, 63–B 11, 63–B 12, 63–B 13, 63–B 15, 63–G 7 (preliminary edition); United Provinces and Central India, sheets 54–N 3, 54–O 1 (second preliminary edition), 54–O 2 (preliminary edition) 54–O 6 (preliminary edition); South-Eastern Fronter, scale 1 inch to 4 miles, sheet 84–B and F (1 s.w.) 5th edition. Calcutta: Map Record and Issue Office, 1913. *Presented by the Surveyor-General of India.*

Tibet. **Filchner.**

Wissenschaftliche Ergebnisse meiner Expedition nach Nord-Ost-Tibet 1904. Karten. Aufgenommen von Wilhelm Filchner. Konstruiert und gezeichnet von O. Wand und G. Scholz. Teil. i. ii. iii. iv. Berlin: E.S. Mittler und Sohn, 1913. *Presented by Lieut. Wilhelm Filchner.*

This will be specially noticed in the *Geographical Journal.*

AFRICA.

Angola. **Commissão de Cartographia, Lisbon.**

Esboço da Carta de Angola. Scale 1 : 2,000,000 or 1 inch to 31·5 stat. miles. 2 sheets. Lisbon: Commissão de Cartographia, 1912.

Belgian Congo. **Institut Cartographique Militaire, Brussels.**

Carte du Congo Belge. Scale 1 : 4,000,000 or 1 inch to 63·1 stat. miles. Brussels: Institut Cartographique Militaire, 1913.

Morocco. **Barrère.**

Carte du Maroc. Dressée sous la direction de Henry Barrère. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. 4 sheets. Paris: Henry Barrère, 1913. *Presented by the Publisher.*

This map resembles in general appearance that of R. de Flotte de Roquevaire previously published by the same firm; but a comparison of the two will show at once that the whole has been redrawn and a large amount of new detailed information added. During recent years numerous route traverses by French officers have been made throughout the country, and these have been utilized in the compilation of this map. Relief is shown by form lines and neutral tint shading, routes in red, water blue. Plans of Marrakesh and Fez on enlarged scales are given as insets.

AMERICA.

Canada. **Dept. of the Interior, Ottawa.**

Standard Topographical Map of Canada. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheet 14 S.W. (part), Moncton, Nova Scotia and New Brunswick. Ottawa: Department of the Interior, 1913. *Presented by the Department of the Interior, Ottawa.*

Canada. **Department of Mines, Geological Survey.**

Geological map of the Dominion of Canada and Newfoundland. Scale 1 : 6,336,000 or 1 inch to 100 stat. miles. Ottawa: Department of the Interior, Geological Survey, 1913. *Presented by the Geological Survey of Canada.*

Canada—Ontario. **Department of Mines, Geological Survey.**

Advance geological copy of map of Gowganda Mining Division and Vicinity, Ontario. Scale 1 : 63,360 or 1 inch to 1 stat. mile. 2 sheets. Ottawa: Department of Mines, Geological Survey, 1913. *Presented by the Department of Mines, Geological Survey, Ottawa.*

United States. **U.S. Geological Survey.**

Geological Atlas of the United States. Scale 1 : 125,000 or 1 inch to 1·9 stat. miles. Folio: Apishapa, Colorado. Washington: Department of the Interior, U.S. Geological Survey, 1912. *Presented by the U.S. Geological Survey.*

AUSTRALIA.

New South Wales. **Department of Lands, Sydney.**

Map of New South Wales Railways, showing coach and other routes from the various stations, together with mileage from Sydney. Scale 1 : 1,850,000 or 1 inch to 29 stat. miles. Sydney: Department of Lands, 1913.

PACIFIC OCEAN AND ISLANDS.

New Guinea. **Topographical Bureau, Batavia.**

Schetskaart van Nieuw-Guinea (Nederlandsch Gebied). Scale 1 : 1,000,000 or 1 inch to 15·9 stat. miles. 4 sheets. Batavia: Topographical Bureau, 1912.

A useful general map corrected to show the results of explorations up to last year. It is in four sheets, each of which measures 24 by 28 inches. Considerable attention has been paid to the exploration of Dutch New Guinea in recent years, but a glance at this map will show how much still remains to be done.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, from June 29 to July 19, 1913. *Presented by the Hydrographer, Admiralty.*

New Charts—No. 1560, Newfoundland, east coast: Ariége bay and approaches, 3*s*. **New Editions**—No. 2450, England, south coast: Portland to Owers, 3*s*. 1481, Scotland, east coast: River Tay. Plan: continuation of river Tay above Tay bridge, 3*s*. 114*a*, Scotland, east coast: Firth of Forth, St. Abbs head to Edinburgh, 3*s*. 2052, England, east coast: Harwich approaches. Plan: Woodbridge haven, 3*s*. 3191, England, east coast: River Thames, Woolwich to Erith, 3*s*. 3337, England, east coast: River Thames, London Bridge to Woolwich, 3*s*. 708, Madagascar, west coast: Anchorages on the west coast of Madagascar: Nosi Mitsio (Minow islands), Ampasimena (Diamond) bay, Boyanna (Bali) bay. Plan added: Nosi Lava anchorage, 2*s*. 38, Arabian sea: Maskat to Karáchi. Plans: Chahbár bay, Gwatar bay, Gwádar bay. Plan added: Sonmiyáni harbour, 3*s*. 2562, China: Canton river (Chu kiang) with its western branches to Sam shui, and adjacent country. Plans added: Nam sha bay, Boddam cove, Sheung lung (Stone Dragon) rock, 4*s*. 2388, Siberia: Sea of Okhotsk. Plans: Port Aian, Ola anchorage, Zabiyaka bay, 3*s*. 2759*a*, Australia: Australia, northern portion; and the adjacent islands and seas between it and the Equator, 3*s*. 780, Pacific

ocean: Pacific ocean comprised between the parallels of 37° N. and 37° S., and extending from the Philippine and Celebes islands, New Guinea and Australia, to San Francisco and Easter island, south-west sheet, 3s. 1285, South America, Peru: Begueta bay to river Chicama. Plans: Culebra cove, Guañape islands. Plans added: Approach to Salaverry. Salaverry road, 2s. 1224, South America, west coast: Plans on the coast of Peru: Lambayeque road, Pacasmayo road, Malabrigo road, Approach to Huanchaco, Huanchaco road, Casma bay, Port Samanco or Guambacho, Huarmey bay, 2s. 1279, South America, Peru: Pescadores point to Independencia bay. Plans added: Independencia bay, Atico road, 2s. 1340, South America, Peru and Chile: Plans in Chile and Peru: Islay bay, Lomas road, Ports of San Nicholas and San Juan. Plans of Yio road, Atico road, and Independencia bay on this sheet erased. Plans added: Cerro Azul bay, Arica road, 2s. 1283, South America, Peru and Chile: Cape Lobos to Pescadores point. Plans: Port Mollendo, Ocoña anchorage. Plan added: Ylo road, 2s. 1276, South America, Chile: Herradura de Carrizal to Grande point. Plan: Paposo road. Plans added: Lavata bay, Pan de Azúcar anchorage, Port Flamenco, Ports Caldera and Calderilla, Port Copiapó, Pajonal cove, Herradura de Carrizal, 2s. 1119, North America, Gulf of St. Lawrence: Watagheistic sound, St. Mary islands, etc., 2s.

J. D. Potter, Agent.

Atlantic, North. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, July, 1913. Washington: U.S. Hydrographic Office, 1913. *Presented by the U.S. Hydrographic Office.*

Atlantic, North. **U.S. Weather Bureau.**

Meteorological Chart of the North Atlantic Ocean, August, 1913. Washington: Department of Agriculture, U.S. Weather Bureau, 1913. *Presented by the U.S. Weather Bureau.*

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly Meteorological charts of the North Atlantic and Mediterranean, August, 1913. London: Meteorological Office, 1913. *Price 6d. each. Presented by the Meteorological Office.*

Indian Ocean. **Meteorological Office.**

Monthly meteorological charts of the Indian Ocean, August, 1913. London: Meteorological Office, 1913. *Price 6d. each. Presented by the Meteorological Office.*

Indian Ocean. **U.S. Weather Bureau.**

Meteorological chart of the Indian Ocean, August, 1913. Washington: Department of Agriculture, U.S. Weather Bureau, 1913. *Presented by the U.S. Weather Bureau.*

North America—Great Lakes. **U.S. Weather Bureau.**

Meteorological chart of the Great Lakes, August, 1913. Washington: Department of Agriculture, U.S. Weather Bureau, 1913. *Presented by the U.S. Weather Bureau.*

Pacific, North. **U.S. Weather Bureau.**

Meteorological chart of the North Pacific Ocean, August, 1913. Washington: Department of Agriculture, U.S. Weather Bureau, 1913. *Presented by the U.S. Weather Bureau.*

PHOTOGRAPHS.

Kashmir. **Workman.**

Album of 91 reproductions of photographs of the Hispar glacier, its tributaries and mountains, taken by Fanny Bullock Workman and William Hunter Workman. *Presented by the Authors.*

An album containing a set of excellent photographic reproductions, including panoramas, accompanied by a map from which it is possible to follow readily the route of the expedition and locate the photographs themselves. Some of the views are specially good, and among these may be mentioned those taken with the telephoto lens, such as that of the highest point of Rakaposhi. The photographs are published in the authors' recent work, 'The Call of the Snowy Hispar,' and an account of the expedition will be found in the *Geographical Journal* for February, 1910.

(1) Biafo Hispar watershed peak; (2) Gilgit road descending verdureless mountain flank on north-east side of Burzil river; (3) View of Nanga Parbat; (4) Oasis of Bunji; (5) North-west face of Rakaposhi; (6) North-east face of Rakaposhi;

(7) Telephotograph of highest point of Rakaposhi; (8) Part of the village of Niet; (9) The Mir of Nagar; (10) Group at our camp at Nagar; (11) Men of Nagar seated on grass behind our camp; (12) Nagar types; (13) Alluvial fan deposited by floods issuing from narrow gorge in mountains behind; (14) Crossing Hispar river on bridge composed of two slender planks; (15) Hispar village; (16) Face of rock on south side of extremity of Hispar tongue serving as first theodolite station; (17) Some of the walls enclosing Garumbar glacier; (18) The junction of the Lak glacier, issuing from its gorge-like valley, with the Hispar; (19) Telephotograph of apex of mountain on east side of junction of Lak with Hispar glacier; (20) So-called Nushik La; (21) On edge of bergschrund separating ice-shelf from shattered perpendicular face of mamelon; (22) Ascending ice-wall of mamelon; (23) On summit of mamelon at 18,000 feet; (24) View of upper surface of mamelon; (25) Triple Cornice peak; (26) Standing on narrow shelf beneath ice-cornice at summit of Triple Cornice peak; (27) View north from Triple Cornice peak; (28) View north-east from Triple Cornice peak; (29) Telephotograph of rock-needle rising from north wall of Hispar above opening of Sekambaris nala; (30) Earth-pyramids on steep slope above Hispar glacier; (31) Steep face of high lateral moraine at junction of the Jutmaru with Hispar glacier; (32) Camp on *névé* at junction of two heads of Jutmaru glacier; (33) Portion of south-east wall of east head of Jutmaru glacier; (34) Furrow between edge of Jutmaru glacier and mountain wall, which had to be followed for over half a mile; (35) Avalanche falling on wall of east head of Jutmaru glacier; (36) Séracs on east edge of Jutmaru glacier; (37) Re-entrant on east or upper side of junction of Jutmaru with Hispar, formed at meeting-point of the two streams; (38) Building stone cairn on north bank of Hispar; (39) Alchori col; (40) Lower base camp, 15,354 feet, on north bank of Hispar; (41) Great south ice-wall of Hispar; (42) At camp, 16,486 feet, near head of Kanibasar glacier on its first ascent; (43) Site of camp, at 16,601 feet, near head of Kanibasar glacier; (44) Massif heading in east end of east branch of Kanibasar glacier; (45) Kanibasar glacier; (46) Upper base camp, 15,900 feet, at junction of Last Moraine glacier with Hispar; (47) South aspect of Biafo Hispar watershed peak; (48) South and west faces of Biafo Hispar watershed peak; (49) South and east faces of Biafo Hispar watershed peak; (50) Caravan ascending to camp on flank of Biafo Hispar watershed peak; (51) Highest camp, 19,100 feet, on flank of Biafo Hispar watershed peak; (52) Furrowed, unclimbable, ice-covered face of south-east arête of Biafo Hispar watershed peak; (53) Section of south-east arête of Biafo Hispar watershed peak; (54) Mrs. Bullock Workman and two companions on summit of Biafo Hispar watershed peak, 21,350 feet; (55) Summit of Biafo Hispar watershed peak; (56) Junction of Biafo and Hispar glaciers; (57) Telephotograph down Hispar to mountains west of Makorum glacier; (58) Face of southern wall of Hispar; (59) Passage in centre of ice-wall extending across Névé glacier; (60) Camp on Névé glacier at 18,324 feet; (61) Ascending ice-fall at head of Last Moraine glacier; (62) Stone cairn on mountain shoulder above Upper base camp; (63) Caravan approaching Hispar pass; (64) View west down Hispar; (65) Descent from Hispar pass on Biafo side; (66) Point, or promontory, where south Hispar wall turns sharply and forms west wall of Biafo; (67) View of region around upper half of Biafo glacier; (68) Peaks forming east wall of Biafo glacier; (69) Large western branch of Biafo; (70) Camp on dry bed of drained border-lake; (71) Crossing ascending ice-bridge; (72) Ledge camp, 11,743 feet; (73) Lambardar and Nagar coolies at Ledge camp; (74) Blindfolded porter being carried across jhula bridge spanning Bualdoh river; (75) Ascending rock-precipices by ladders; (76) Large alluvial fan; (77) Extremity of discoloured detritus-covered tongue of Hispar glacier; (78) Lower 12 miles of great southern ice-barrier of Hispar; (79) Upper 10 miles of great southern-ice-barrier of Hispar; (80) Face of peak, 22,060 feet, of south wall of Hispar; (81) Four hillocks of the larger variety, Hispar glacier; (82) Lake in centre of Hispar glacier; (83) Portion of lake in centre of Hispar glacier; (84) Lakelets at upper part of Hispar at altitude of over 16,000 feet; (85) Border-lake between east edge of Jutmaru glacier and lateral moraine; (86) Surface of Jutmaru glacier; (87) West bank, Haigatum glacier; (88) Side of Jutmaru glacier; (89) Edge of Haigatum glacier; (90) A large mass of ice on edge of Jutmaru glacier; (91) Panorama of upper part of Kanibasar glacier.

N.B.—It would greatly add to the value of the collection of Photographs which have been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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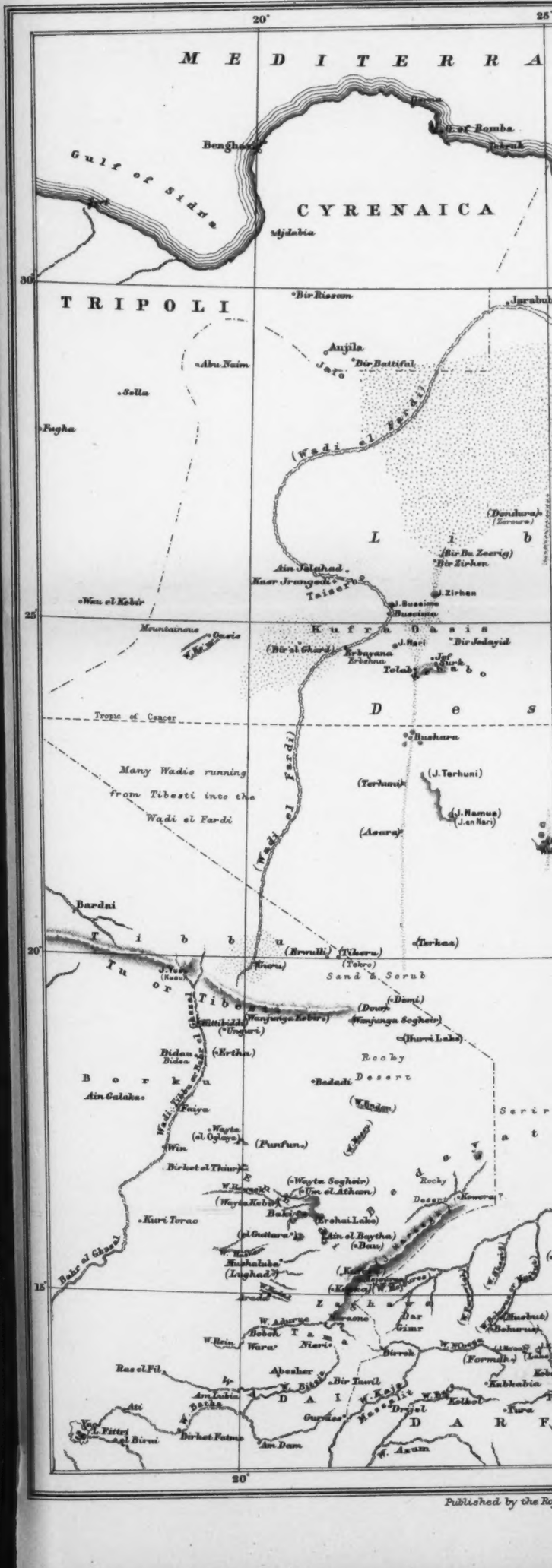

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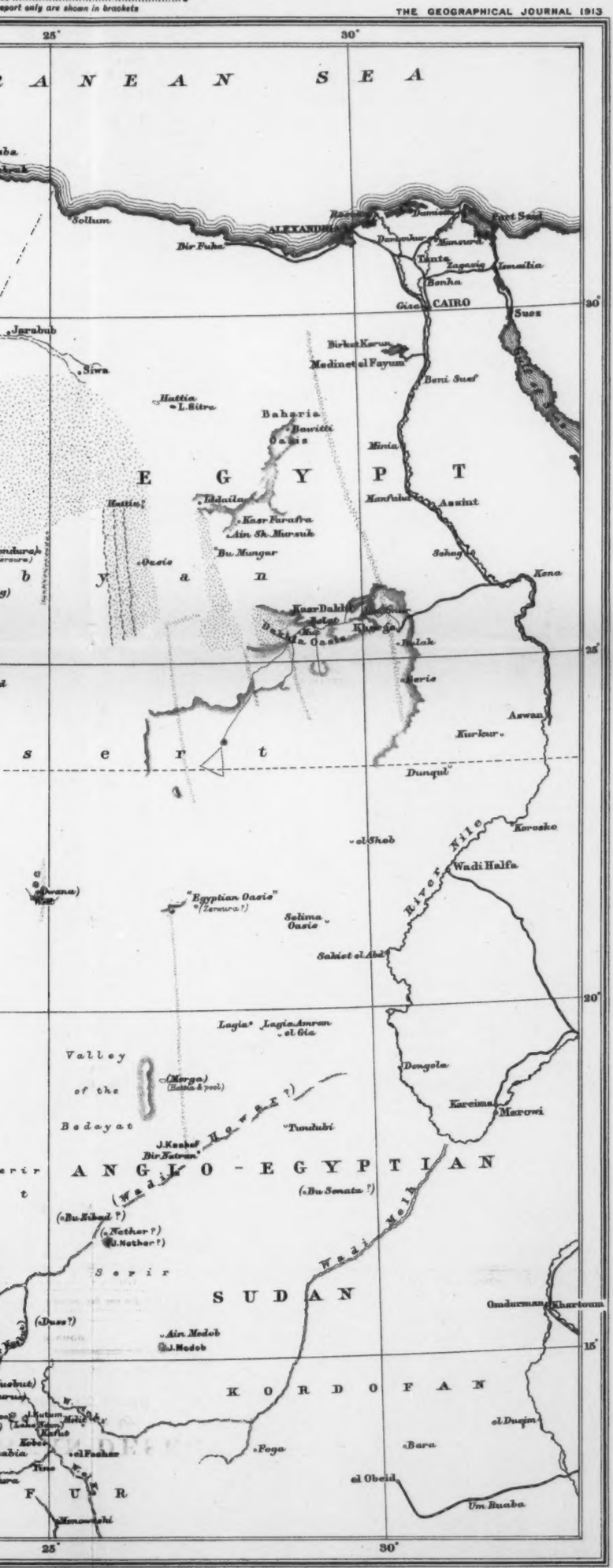

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